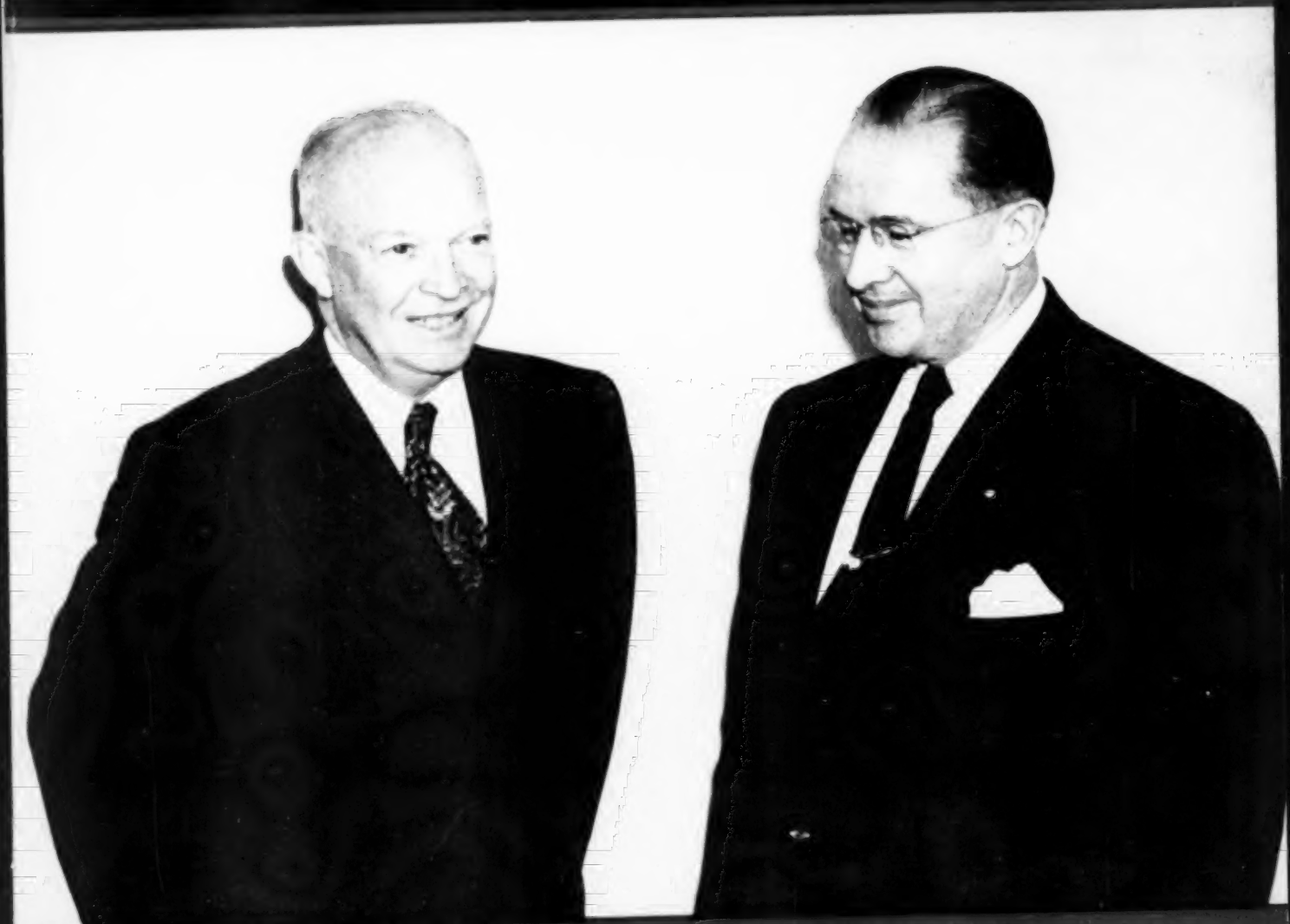
Vol. 8, No. 2

FEBRUARY, 1953

AGRICULTURAL CHEMICALS



In This Issue:

Quality* INSECTICIDES

Only POWCO BRAND can give you these positive assurances of consistent top laboratory-controlled *quality* in every insecticide shipment.

- ***FINENESS**—ALL POWCO BRAND insecticide powders are reduced to micron-size particles by high powered precision equipment. This insures the dusting qualities you need for maximum insect control.
- ***EMULSIFICATION**—All POWCO BRAND insecticide emulsion concentrates are designed to produce the most desired emulsions in your particular type of water.
- ***WETTABILITY-SUSPENSIBILITY**—All POWCO BRAND wettable powders are highly suspensible and wet quickly for ease in application and maximum effectiveness.

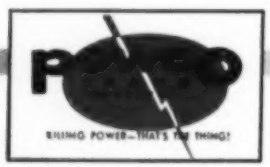
POWCO BRAND insecticides cost you no more but pay you well. For details, call your nearest Powell representative, or write direct to our New York office.

John Powell & Co., Inc.

ONE PARK AVENUE, NEW YORK 16, N. Y.

Sales Offices: Philadelphia • Pittsburgh • Chicago • Huntsville • Fort Worth • Omaha • San Francisco • Atlanta

Representatives in Principal Cities of the World



DDT • TOXAPHENE • BHC • CHLORDANE • LINDANE • ROTENONE • SABADILLA • PYRETHRUM & PYRIN
PIPERONYL BUTOXIDE • ALLETHRIN • ANTU • TEPP • PARATHION • ALDRIN • 2, 4-D & 2, 4, 5-T

LOOK TO POWELL...FOR CONSISTENT, TROUBLE-FREE QUALITY

SOIL CONDITIONING
SOIL INSECT CONTROL

. . . 2 bright new fields for you with Attapulgus inert materials

New things come often in the agricultural chemistry business. Which is really why the industry puts a big store of confidence in Attaclay, our carrier and diluent. For eight years, Attaclay has taken new things in stride—toxicants, equipment, methods, formulations—and delivered top-flight performance across the board.

This makes a sound basis for our suggestion that you line up an Attapulgus inert material for the soil conditioning and soil insect control formulations you plan to market.

1 ATTAPULGUS *carriers for* SOIL PESTICIDES

Granular grades have been developed which have formulating and field application characteristics of particular value in soil insect control. Like "thirsty" Attaclay, these commercially-proved granular grades have great sorptive capacity, insuring easy and effective processing. Excellent coverage results are obtained when applied either from the ground or the air. Particle size ranges to suit all formulations.

2 ATTAPULGUS *inert materials for* SOIL CONDITIONER FORMULATIONS

Attaclay, and grades prepared to other specifications, are being commercially utilized today in both wettable and dry formulations of soil conditioner products. Attaclay's high sorptivity, broad compatibility, and anticaking properties recommend it for all types of mixtures. Its inherent wettability and suspensibility mean premium wettable products and savings in wetting agents. Coarser particle size ranges available for special dry formulations.

Have you been in touch with us about your contemplated products in these two bright new fields? You're welcome to data sheets, free test samples, and technical help.

ATTAPULGUS Minerals & Chemicals Corporation

Dept. P, 210 West Washington Square, Phila. 5, Pa.

Her fingertips imagine the taste

The lady doesn't trust her eyes alone.

The buyer of Multiwalls is in much the same position.

Aside from package design, it's hard to tell one manufacturer's bag from another's simply by looking at it or fingering it.

Put the bags out of sight and you may be able to see many differences.

Men who buy 85 per cent of all Multiwalls consider* these intangibles more important than any other factor when they choose their supplier.

Invariably, these are among the first questions they ask . . .

"Is this company big enough?"

"Do they have a fair allocation policy?"

"Are their prices competitive?"

"Do they respect delivery dates?"

In a nutshell—

"Are they good people to do business with?"

We can't tell you what the answers are when these Multiwall users consider Union. This we do know . . . and the inference is yours to make—

In these days of industrial pressure, when *dependability* is a fervent wish as well as a word, men to whom Multiwalls are important are placing an increasing share of their orders with Union.

More so every day . . .

IT'S UNION FOR MULTIWALLS

TRADE MARK UNION

*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

President Eisenhower and Secretary of Agricuture Ezra Taft Benson scarcely need introduction to any audience in the world. Policies to be pursued by Mr. Benson in connection with U.S.D.A. research and other matters affecting the agricultural chemical trade were not evident at press time, but general consensus was that the new secretary appreciates the value of use of chemicals in food production.

FEBRUARY 1953

VOL. 8 No. 2

A Monthly Magazine For the Trade

•

LAWRENCE A. LONG
Editor

JOHN A. NICHOLSON
Advertising Manager

•

Editorial Advisory Board . . .

DR. ALVIN J. COX
Palo Alto, Calif.

LEA S. HITCHNER
Washington, D. C.

DR. S. E. A. MCCALLAN
Yonkers, N. Y.

DR. CHARLES E. PALM
Ithaca, N. Y.

DR. COLIN W. WHITTAKER
Washington, D. C.

MEMBER AUDIT BUREAU OF CIRCULATIONS

In This Issue:

AGRICULTURAL CHEMICALS

Subscription Rates: *One year, United States,* $3.00; *Canada and Pan American countries,* $4.00; *Foreign,* $7.00. *Published monthly on the 15th by Industry Publications, Inc. Wayne E. Dorland, President; Ira P. MacNair, Secretary-Treasurer. Publication office, 123 Market Place, Baltimore 2, Md. Advertising and editorial office 175 Fifth Ave., New York 10, New York — Chicago Office, 333 N. Michigan Blvd. Advertising rates made known on application. Closing date for copy— 15th of the month previous to date of issue.*

Entered as second-class matter November 4, 1949, at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

Calmonite

AMMONIUM NITRATE-LIME

20.5% NITROGEN

2 FERTILIZERS IN 1
Contains 10.25% quick-acting *nitrate* nitrogen.
Contains 10.25% longer-lasting *ammonia* nitrogen.

GREEN PELLETS READY TO USE
Sized for flow and ease of application in broadcasting, top dressing, side dressing, and irrigation. Non acid-forming.

ECONOMICAL SOURCE OF N
At low cost, Calmonite furnishes Nitrogen in the 2 forms needed by all plants — for rapid, early vigorous growth and sustained development.

SUPPLIES CALCIUM, TOO
Contains 35% to 40% calcium carbonate, secondary plant-food essential to soil productivity and good crop yields.

NOW AVAILABLE, F.O.B.
Regular Atlantic and Gulf ports, in even-weight, 6-ply paper bags with 2 bituminous liners.

LOOK AT CALMONITE!
Write for a sample and for additional information today.

EXCLUSIVE DISTRIBUTORS FOR
RUHR-STICKSTOFF AKTIENGESELLSCHAFT,
BOCHUM, GERMANY

H. J. BAKER & BRO.
600 Fifth Avenue, New York 20, N. Y.
Branch Offices
Baltimore, Chicago, Savannah & Tampa

H. J. BAKER & BRO.

aldrin
dieldrin
...the ones to push in '53

HERE'S WHY:

1. **Many uses**
2. **Proven effectiveness**
3. **Big demand**

Demand for these versatile, effective, companion products will be high this year. The outstanding performance given last season by aldrin and dieldrin plus the largest advertising campaign put behind such products means greater profit to you.

Aldrin with its fast killing action and dieldrin with its long residual effectiveness are recommended for control of a wide number of agricultural and public health pests. At this time labels have been accepted for control of the following:

ALDRIN	DIELDRIN
Boll weevil and many other cotton pests	Boll weevil and many other cotton pests
Root worms	Alfalfa weevil
Wireworms and many other soil pests*	Plum curculio
Grasshoppers	Thrips
Turf pests	Ants
	Mosquitoes
	Flies
	Many other public health pests

SEND coupon for the latest technical information on formulation and methods of applying aldrin and dieldrin.

*Aldrin-Fertilizer mixture labels accepted by USDA

Julius Hyman & Company Division
SHELL CHEMICAL CORPORATION
P. O. Box 2171, Denver 1, Colorado

Please send me information on aldrin and dieldrin. I am interested in formulating insecticides for control of these pests (please list).

NAME_____

ADDRESS_____

you too can improve your

insecticide production

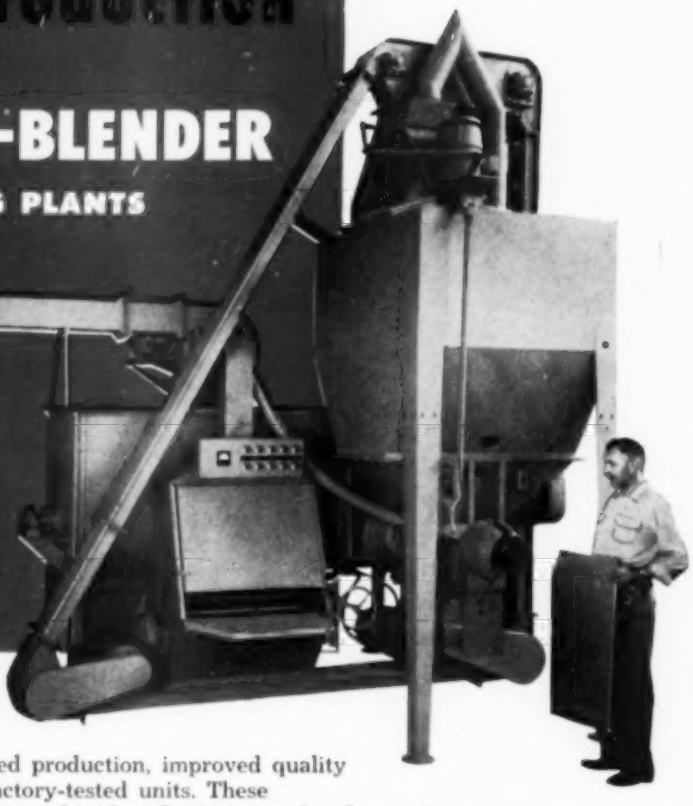
with

Poulsen R.T.R.* **UNI-BLENDER**

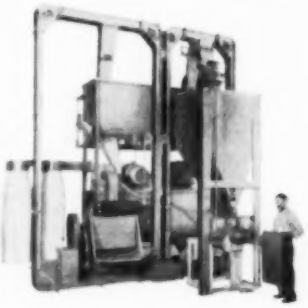
COMPOUNDING PLANTS

*R.T.R.—
Ready-To-Run
U.S. Pat. No. 2,591,731

from base materials to finished product in one complete, compact, Ready-To-Run unit.

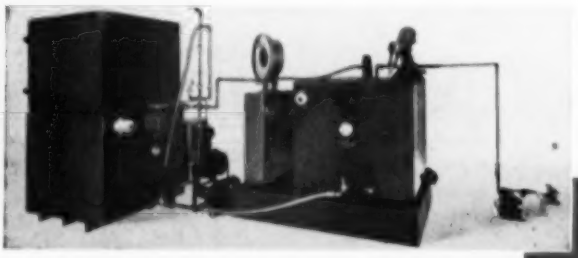


Many of the largest insecticide producing companies and smaller processors alike have substantially increased production, improved quality and reduced production costs with these factory-tested units. These Ready-To-Run plants MIX, BLEND and PACKAGE dry, free-flowing, powdered materials, including many formulas involving liquid impregnation. Many users report production increases of 200% to 300% with R.T.R. Uni-Blender Compounding Plants.



STANDARD TYPE: Mixes and blends dust concentrates with diluents to produce and package field strength insecticides of consistently uniform superior quality. Produces from three to four 40 cu. ft. batches per hour with minimum labor.

DUAL TYPE: Performs *three* processes of production: 1) Mixes, blends and packages dry, free-flowing powdered materials. 2) Compounds finished products from ingredients requiring reduction in particle size (to −325 mesh if desired). 3) Compounds finished products from ingredients involving liquid impregnation. Handles 40 cu. ft. batches.



R.T.R. Uni-Blender Liquid Formulating Plants provide for liquefying, blending and injection of specific technical grade toxicants required for the formulation of numerous concentrates and liquid spray chemicals.

Write today for technical bulletins CP-310 and LF-110.

Poulsen

A. E. POULSEN
AND COMPANY
Established in 1939

ENGINEERS AND MANUFACTURERS
Materials processing and materials handling equipment

3305 EAST SLAUSON AVENUE, LOS ANGELES 58, CALIFORNIA

Modern mechanized equipment used for preparing the soil to harvesting the crops is a great boon to the American farmer.

Of prime importance to agriculture is the contribution made by the fertilizer industry. Increased use of better fertilizers has reclaimed millions of impoverished acres—produced larger and better crops.

We are proud that PCA high grade red muriate is a vital ingredient in so many fine quality mixed fertilizers.

POTASH COMPANY OF AMERICA
Carlsbad, New Mexico

GENERAL SALES OFFICE . . . 1625 Eye Street, N. W., Washington, D. C.
MIDWESTERN SALES OFFICE . . . First National Bank Bldg., Peoria, Ill.
SOUTHERN SALES OFFICE . . . Candler Building, Atlanta, Ga.

FOR MAXIMUM COVERAGE WITH MINIMUM WASTE USE CONTINENTAL CLAY AS YOUR CARRIER

NEW BULLETIN No. D23 explains how to insure the effect of your high bulk dusts and your wettable concentrates by using CONTINENTAL CLAY as your carrier.

With CONTINENTAL CLAY as your carrier, you can insure the effectiveness of both your high bulk dusts and wettable concentrates.

CONTINENTAL is an economical, top quality clay that gives greater acre coverage. Its unusually fine particle size is only 0.8 micron by air permeation.

WETTABLE CONCENTRATES

CONTINENTAL CLAY wets as readily as any carrier tested in the Vanderbilt Laboratory. Highly compatible, CONTINENTAL is safe to use with all types of toxicants. CONTINENTAL gives finely dispersed suspensions that are completely free from any agglomeration.

HIGH BULK DUSTS

CONTINENTAL CLAY is uniform to assure even distribution of the toxicants. Only 0.75% is retained on a 200 mesh screen. Its compatibility insures full effectiveness of the toxicant. Its high bulk gives increased absorptiveness and excellent flowability to finished dusts.

Don't gamble when formulating dusts and sprays. Write today for the latest technical data on CONTINENTAL CLAY.

☐ Please send bulletin No. D23.

☐ Please send sample of CONTINENTAL CLAY.

NAME _____

POSITION _____

(Please attach to, or write on, your company letterhead)

R. T. VANDERBILT CO.

SPECIALTIES DEPARTMENT

230 PARK AVENUE **NEW YORK 17, N. Y.**

What TEPP* can do for

farmers:

Spray one day and harvest poison-free crops 48 hours later!

processors:

Cleaner crops that need less washing, fewer rejects due to last-minute infestations!

They all like remarkable TEPP—the pesticide that kills without leaving any lingering poisonous residue. When properly handled, TEPP can assure cleaner, higher quality crops that mean more profits for both farmer and processor.

Low cost, amazingly effective TEPP kills aphids, thrips, red spider mite, leafhopper nymphs, flea beetles and many other pests. TEPP is available 1) as a liquid concentrate, 2) as a stabilized dust, and 3) with other active ingredients. For quick kills and residue-free crops, specify TEPP formulations from your supplier. For the names of manufacturers of TEPP, write to Eastman Chemical Products, Inc., Chemicals Division, Kingsport, Tennessee.

TEPP*

means pest-free crops

poison-free crops

**Tetraethyl Pyrophosphate is made from triethyl phosphate—an Eastman chemical. TEPP is not supplied by Eastman Chemical Products, Inc.*

Eastman
CHEMICAL PRODUCTS, INC.
KINGSPORT, TENNESSEE

Sales representative for **TENNESSEE EASTMAN COMPANY**, division of **EASTMAN KODAK COMPANY**

That's right!

A harvest of packaging ideas and finished bags. And Betner is especially pleased with the Betner "Duo-Tite" bag. It's designed particularly for bulk powdered products. Constructed with special liners, the "Duo-Tite" bag assures "no-sift" of particles . . . whether it contains chemicals, insecticides, fertilizers, or any bulk powdered product.

It's folded, glued and heat-sealed to *positively prevent* sifting. The "Duo-Tite" is available in a variety of sizes (holds 1 to 25 pounds), colors and combinations of materials. Each bag is inner-heat sealed and protected by "Duo-Tite" turnover. And the price will interest you.

BETNER'S SERVICE IS COMPLETE . . .

Betner can supply the special machinery for closing the "Duo-Tite" bag . . . it heat-seals, double folds and pastes the tops in exactly the same manner as the bottom is constructed.

- **Whatever the packaging need, there's a Betner bag . . . FILL IT!**

Benj C Betner Co *Devon, Pa.*

***Plants also located in:* Richmond, Virginia; Paris, Texas; Appleton, Wisconsin; Los Angeles, California**

OPEN THESE FOUR DOORS

to new profits, new markets in SOLUBLE FERTILIZERS

The fast-moving, fast-growing liquid fertilizer market's setting a pattern for profit that's hard to beat. *Now's* the time to move in this market.

Monsanto helps you by furnishing low-cost concentrated nutrients that are pure, soluble and easily compounded.

Moreover, you'll find that your customers will order and reorder soluble fertilizers because of these advantages:

Easy to apply— to use, just add water and apply with standard farm equipment.

Efficient to use —nutrient benefits are readily available to plant.

Versatile —use for leaf feeding, starter solutions, seed treatment or side dressing.

Simple to handle —concentrated form makes lightweight, compact shipments.

For more information, write MONSANTO CHEMICAL COMPANY, Phosphate Division, 1700 South Second Street, St. Louis, 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle, Twin Cities. In Canada, Monsanto Canada Limited, Montreal.

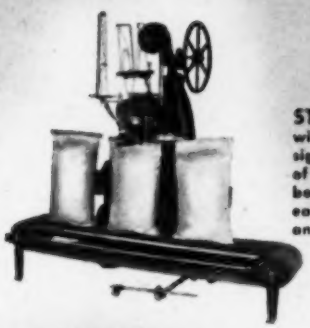
MONSANTO PLANT NUTRIENT CHEMICALS			
	N	P_2O_5	K_2O
Monopotassium Phosphate (Crystals)	—0—	51.6%	34.2%
Diammonium Phosphate (Crystals)	21.0%	53.85%	—0—
Monoammonium Phosphate (Crystals)	12.2%	61.61%	—0—
Phosphoric Acid (75.0%) (Liquid)	—0—	54.5%	—0—

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY — WHICH SERVES MANKIND

BAG CLOSING MACHINES *Engineered*

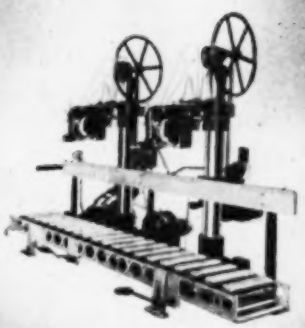
TO MEET MODERN PRODUCTION REQUIREMENTS!



STYLE 21800 H *(left)*, equipped with 80600 H sewing head, is designed for fast, economical closing of paper bags. Bag is sewed, tape-bound, and tape is cut off neatly at each end of closure. Sewing head and conveyor adjustable vertically.

CLASS 20500 *(above)* machines are heavy duty, high production units for closing medium and heavy weight bags. Available with power-driven horizontal conveyor, inclined conveyor, or both; or with conveyor transmission unit only, for plant production line.

STYLE 20100 H *(left)*, is a heavy duty, high production column type machine designed for use with plant conveyor systems. Sewing head is pedal controlled.



DUPLEX MACHINES *(right)* are designed for closing double bags. The first sewing head closes the inner bag; the second closes either the outer bag alone, or both bags together for extra safety. Also recommended for single closures where continuous operation is a must — operator can instantly switch to other head.

Union Special®

No two jobs are exactly alike—that's why Union Special builds a wide variety of bag closing equipment. In the Union Special line you will find machines for closing all sizes and kinds of bags from small textile or paper bags of one pound, or less, up to the largest jute or multiwall paper bags in use today. And whether your schedule calls for closing just a few bags or for high continuous output, Union Special can supply the equipment to do the work efficiently, economically, dependably! FOR THE BEST IN BAG CLOSING EQUIPMENT, LOOK TO UNION SPECIAL. See your Union Special representative for recommendations, or write.

Ask for Recommendations

UNION SPECIAL MACHINE CO.
447 N. Franklin St., Chicago 10, Ill.

Gentlemen: Without obligating me, please furnish information on bag closing equipment to handle the following production:

Kind of bags used?_____

Filled weight of bag?_____

Material being packed?_____

Maximum bags per minute?_____

Check-weighing required?_____

Conveyor required on Machine?_____

Power: ☐ D.C., ☐ A.C., Volts_____

Phase_____ Cycles_____

Name_____

Company_____

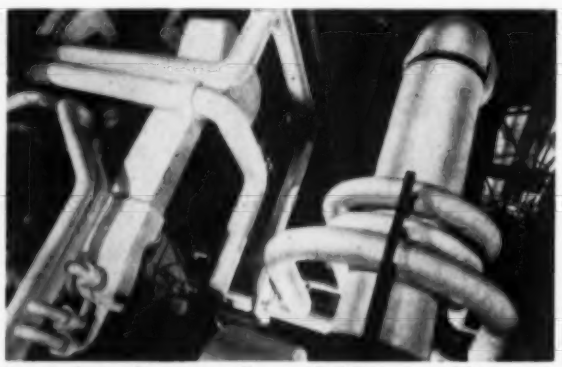
Address_____

MACHINE COMPANY
447 North Franklin St., Chicago 10, Illinois

Organized in 1913 to serve the vegetable and citrus growers of Florida, West Coast Fertilizer Company has long been a pioneer in the field of specialized fertilizers. Located in Tampa, they give overnight service to virtually all Florida points. Annual production is in excess of 40,000 tons.

West Coast Fertilizer Co.

...Another Spensol User



From plants like this, Spensol (Spencer Nitrogen Solutions) is shipped direct to America's leading mixers. Dependable service has made Spensol a favorite ammoniating solution coast-to-coast.

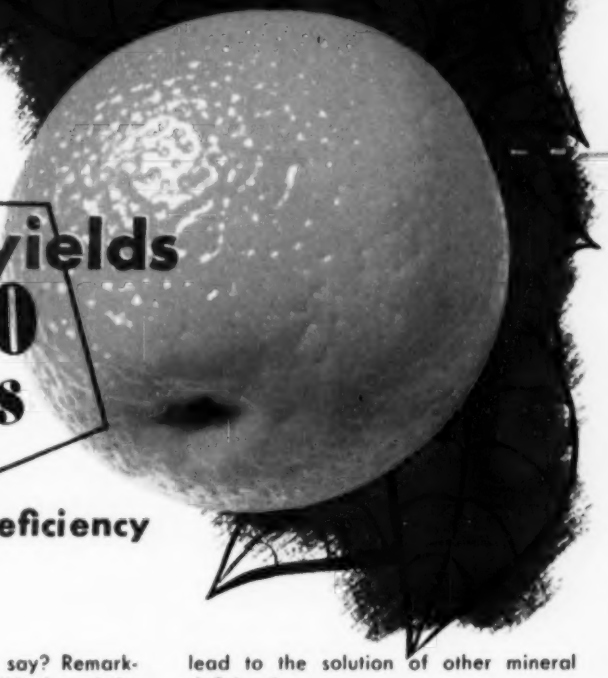
These technical service experts specialize in finding the right answer to your production problems, even if you are not a Spencer customer. There is no charge for this Spencer service.

SPENCER®

SPENCER CHEMICAL COMPANY, Dwight Bldg., Kansas City 5, Mo.
District Sales Offices: Atlanta, Ga. • Chicago, Ill. • Memphis, Tenn.
Works: Pittsburg, Kansas; Henderson, Ky.; Charlestown, Ind.; Chicago, Ill.
Vicksburg, Miss. (under construction)

America's Growing Name in Chemicals

SEQUESTRENE* NAFe



increases citrus yields 5 to 10 times

in severe cases of iron deficiency

Remarkable figures, you say? Remarkable even in this day of "Jack and the Beanstalk" yields?

We agree. And yet . . .

Mere mathematics fail to tell the whole story. Sequestrene NAFe *does* increase citrus yields 5 to 10 times but more than that this formulation makes a truly significant contribution to agriculture:

It corrects iron deficiency, a problem that has plagued farmers and scientists alike.

The correction of iron deficiency is the beginning, the opening wedge that may lead to the solution of other mineral deficiencies.

Combinations of Sequestrene and minerals such as zinc, copper, manganese and magnesium are now being applied on an experimental basis. Progress has been satisfactory.

There is much to do, much to learn. But the results to date, in the field of iron deficiency at least, are no longer merely "interesting"—they are, instead, making the hopes of the early research stand up under the exacting demands of actual field conditions.

Literature available on request: (1) technical bulletin on "Metal Complexes of Sequestrene in Plant Nutrition"; (2) pamphlet on "Iron Chlorosis in Citrus"; (3) paper by Ivan Stewart and C. D. Leonard on "Iron Chlorosis—Its Possible Causes and Control"; paper by Louis Jacobson on "Maintenance of Iron Supply in Nutrient Solutions by a Single Addition of Ferric Potassium Ethylenediamine Tetraacetate".

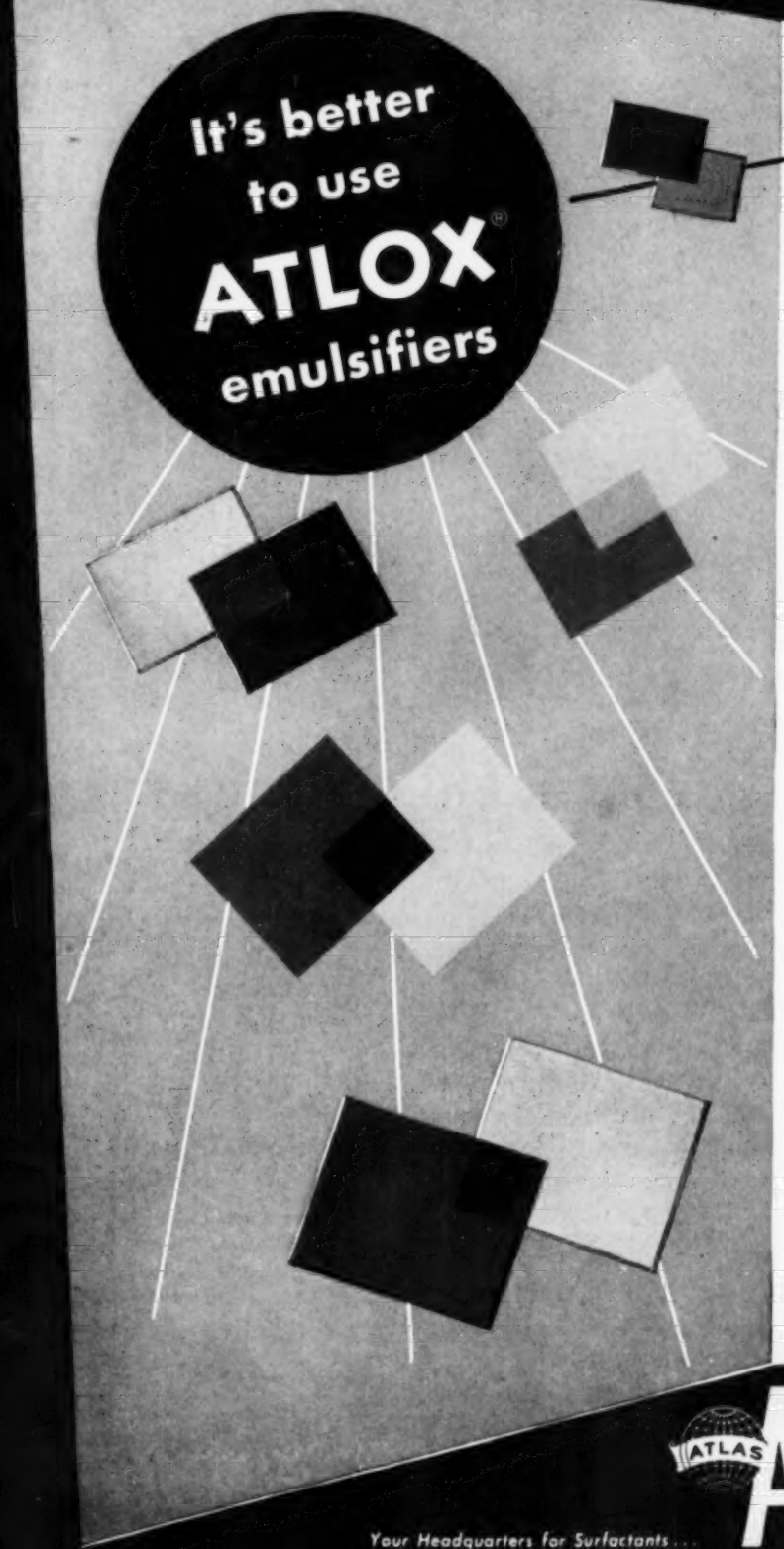
*"Sequestrene" is the registered trademark of the product of Alrose Chemical Co., a Geigy Company.

Geigy Company, Inc., Insecticide Division, are the exclusive sales agents for Sequestrene in the agricultural field.

ORIGINATORS OF Geigy DDT INSECTICIDES

GEIGY COMPANY, INC. 89 BARCLAY STREET N. Y. 8, N. Y.

Aberdeen, N. C.; Burlington, Iowa; Colorado Springs, Colo.; Elkton, Md.; Fresno, Calif.; Houlton, Me.; Leland, Miss.; McGregor, Tex.; Orlando, Fla.; Walla Walla, Wash.



because...

they make oil and water blend readily with your toxicant

One reason why formulators of agricultural chemicals use more ATLOX emulsifiers than any other kind is that these products make stable concentrates from such a wide range of toxicants and solvents.

What's more, concentrates can be made with ATLOX emulsifiers so that they'll blend well with all sorts of water—hard or soft, hot or cold—for use in knapsack, low-gallonage, high-gallonage or other equipment.

To assist in your selection, Atlas offers:

A WIDE VARIETY OF EMULSIFIERS: suitable for insecticides, herbicides, oil sprays, wettable powders.

TECHNICAL SERVICE: by Atlas specialists who can give you practical help in developing formulas for materials now on the market, and for those that tomorrow will bring.

For literature or for technical help, write or call Atlas today.

Your Headquarters for Surfactants...

INDUSTRIAL CHEMICALS DEPARTMENT

ATLAS POWDER COMPANY

WILMINGTON 99, DELAWARE

offices in principal cities

ATLAS POWDER COMPANY (CANADA) LTD
BRANTFORD, CANADA

Is it Time to Redesign Your Bags?

Well-designed, expertly printed V-C Multiwall Bags help build customer confidence in your products and your company. Good-looking bags have real sales appeal. If your multiwall bag trade design looks like years ago, call on V-C's experienced art service.

V-C Multiwall Bags are made of top-quality materials, carefully constructed to stand rough, tough treatment in handling, in shipping and in storage. They are available in standard sizes in the following types: sewn open mouth, sewn valve, sewn valve with sleeve or with tuck-in sleeve.

Now is the time to discuss your bag problems with a V-C representative.

Virginia-Carolina Chemical Corporation

BAG DIVISION: 9th and Perry Streets, Richmond, Virginia

DISTRICT SALES OFFICES:

Atlanta, Ga. • Wilmington, N. C. • E. St. Louis, Ill. • Cincinnati, Ohio

VC BAGS ®

Other V-C Products: Phosphate Rock Products • Complete Fertilizers • Chemicals • Cleansers • Textile Fibers • Pest Control Products

"10-10-10 fertilizer more than doubled pasture production"

says Henry M. Berg, Blanchardville, Wis.

Mr. Berg is shown here on his farm with two of his three sons, Robert (center) and Duane (right).

With results like this, it's easy to see why Henry M. Berg of Blanchardville, Wis., calls his use of 10-10-10 complete fertilizer on pastures "the best investment we ever made."

In 1951, Mr. Berg and his sons applied 10-10-10 to his pastures at the rate of 560 pounds per acre and fenced off a portion as a test plot. The yield per acre on this fertilized plot was 8,025 pounds against 3,750 pounds of dry matter on unfertilized fields. The unfenced portion, used for pasture, furnished fresh grass for cattle all summer long.

In 1952, 250 pounds of 10-10-10 were used and the results were approximately the same.

Bigger yields for farmers mean better business for you

● Pastures are only one place where application of high-nitrogen complete fertilizers pays off. Corn, small grains, orchards and many other crops respond with equally impressive yields.

As more and more farmers discover how profitable an investment in high-nitrogen fertilizers can be, demand for them will go up and up. Meet this demand among your customers with the finest high-nitrogen fertilizers you can mix, and that means fertilizers that get a major share of their nitrogen content from U·S·S Ammonium Sulphate.

Dry, free-running U·S·S Ammonium Sulphate gives equally outstanding performance in mixing and in use. Since its nitrogen is in the ammonia form, it won't leach out during spring rains, yet converts to readily available form in the warm, moist growing season.

For complete information on U·S·S Ammonium Sulphate, contact our nearest Coal Chemical sales office or write directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

U·S·S AMMONIUM SULPHATE

UNITED STATES STEEL

DDT

TECHNICAL DDT

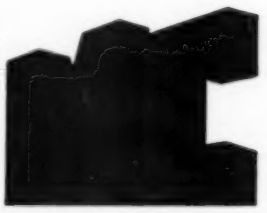
DDT DUST CONCENTRATE

75% DDT WETTABLE POWDER

when you want it promptly

Check with Michigan Chemical for your continuous, fast supply of DDT. You can be sure of exceptionally high purity, uniform production, and prompt service.

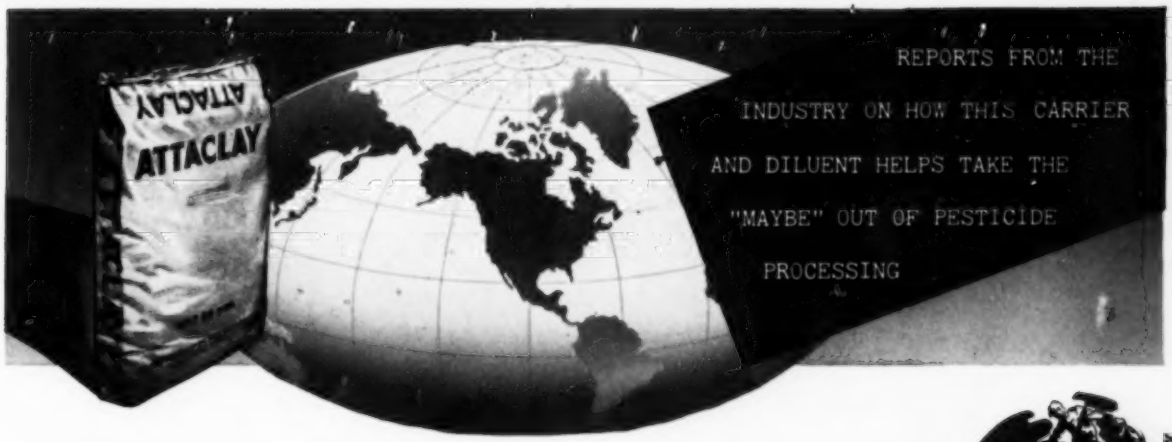
Strategically located in the midwest agricultural area, Michigan Chemical is a basic producer of DDT for Agricultural use. This, together with favorable transportation facilities, assures you a most satisfactory source. Just as a trial, place your next order with Michigan Chemical. You'll get results that surpass promises.



MICHIGAN CHEMICAL CORPORATION • St. Louis, Michigan

SALES OFFICE: 230 Park Avenue
New York 17, New York

BASIC MANUFACTURERS OF INDUSTRIAL, PHARMACEUTICAL, AND AGRICULTURAL CHEMICALS



Another need for Attaclay's dust conditioning ability wherever you go

LOCATION: Texas

OPERATION: Cotton Dust Base Manufacturing

OWNER: *Here in our plant we have another name for Attaclay's conditioning ability—we call it "built-in quality control." Our dusts are dry and loose when made—and stay that way until used. There's always a market for premium products.*

LOCATION: North Carolina

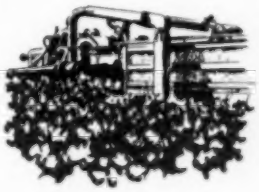
OPERATION: Finished Dust Blending

SUPERINTENDENT: *The more flowable a base, the better the end product. That's why we strive to use only Attaclay-mixed bases; or, Attaclay as upgrading conditioner where the base is made with another carrier.*

LOCATION: Mississippi

OPERATION: Finished Cotton Dust Blending

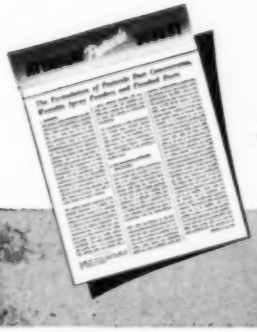
PLANT MANAGER: *We make a full range of cotton dusts. And, at one time or another, we've tried all the diluents. But we've standardized on Attaclay. It has proved itself in spray tank, dust rig, and plane.*



LOCATION: Georgia

OPERATION: Finished Dust Blending

SALES MANAGER: *Our customers are large-scale growers of tobacco and peanuts, or the contract dusters that serve them. These people are willing to pay us a higher price for Attaclay-extended dusts. It's their cheapest way around flowability problems.*



Conditioning—from formulation to kill—is just one of Attaclay's proven abilities. May we assist you in getting the whole story?

ATTAPULGUS Minerals & Chemicals Corporation

Dept. P, 210 West Washington Square, Phila. 5, Pa.

JUST OFF PRESS—the current issue of Attaclay Pesticide Digest, discussing various aspects of pesticide processing. Write for your copy, and future Digests as published.

Opening Up a Profitable New Market with

MALATHON

. . . the newest development in home garden insecticides

These advertisements, appearing in garden pages of metropolitan newspapers across the country, have introduced the new malathon insecticides to over 12,000,000 readers.

Malathon opens up a profitable new market—a market that will grow . . . and grow . . . and grow. For malathon will help the home gardener solve his insect problems as effectively as parathion helps the commercial grower. As reported by the U.S.D.A., malathon "is one of the safest insecticides to handle."

Distributors and Dealers . . . Malathon insecticides in dust, wettable powder and emulsifiable liquid forms are available from national manufacturers, packaged under their own brand names for the garden trade. Consult your favorite sources of supply and arrange now to stock this advertised product.

If you desire further information, write

AMERICAN Cyanamid COMPANY

Agricultural Chemicals Division

30 Rockefeller Plaza, New York 20, N. Y.

Producers of

AERO® Cyanamid Fertilizers—Defoliants—Herbicides

AEROFOAM,® Fertilizer Organic Ammonium Nitrate

PHOSPHATES for Acidulation and Direct Application

THIOPHOS® Parathion Technical

CYANOGAS® Calcium Cyanide Fumigants

HCN Fumigants

POTASSIUM CYANATE Weedkiller for Agriculture and Turf

AEROTEX® Soil Conditioners

THE EDITOR COMMENTS

OF interest to the American fertilizer trade are the recorded reactions of members of a British team of fertilizer experts who visited the U. S. in 1949 to gain facts on how the industry operates. In a 66-page book published by the Anglo-American Council on Productivity, the report scans the American industry, giving it credit for superior performance as compared with general practice in England. It notes the advantages of having available raw materials without depending on imports, and observes further that in the U. S. "unlimited land has always been available for expansion."

Progress in development of concentrated fertilizers is mentioned, as is the technique of direct application of anhydrous ammonia, mostly on pasture land; and "the introduction of nitrogenous liquors into irrigation water and the production of freshly mixed fertilizer of granular and crystalline raw materials for spreading directly on the land by vehicles filled at the factory."

In summary, the Britons observed that acid manufacture in the U. S. is "slightly better" than in England; productivity in superphosphate manufacture is greater in the U. S., but British processes are approaching American performance. In the matter of "compound manufacture, packing and despatch," American practice holds a substantial advantage over comparable performance in Britain, they report. As to handling and storing of raw materials, better layout of American plants and widespread use of railway rolling stock are superior. "These two factors give considerable advantages to the Americans." they observe.

That there is a "growing interest in the bulk delivery and distribution of fertilizers . . ." was noted by the visitors, too. They observed further that the method of offering fertilizer products, made to order and applied directly to the buyer's field, eliminates much labor and cost of handling and spreading.

It is interesting to see ourselves reflected through the eyes of visitors, but of more significance, is the fact that regardless of who looks at it, the answer always seems to be that the fertilizer industry of America is moving ahead rapidly and the potential for expansion is virtually limitless.

SOME of our labels will look like a druggist's prescription if the Smith Bill is passed", was the comment of one pesticide industry spokesman regarding H. R. 620, introduced in Congress the other day by Rep. F. E. Smith of Mississippi.

His idea is to include in the ingredient statement not only a declaration of the active ingredients of a formula, but also, the name of each inert ingredient and their total percentage.

The reaction of the trade has not been that of dropping a lighted match into a gas tank, but there appears to be plenty of resentment toward further disclosure of formulas. As one company head put it, "There won't be anything sacred left". He pointed out that manufacturers have no objection to declaring the active materials contained in a finished insecticide, but do not like being tied up with stating what materials are active and what ones are inert. In a number of cases, the question of whether certain agents add to the killing power of a formulation, remains a moot subject of discussion.

Rep. Smith seems to fear the dumping of inferior pesticides onto the market, and hopes to close every loophole by making manufacturers tell all. Would this stop the inevitable trickle of questionable insecticides into the hands of users? The agricultural pesticide trade has been bothered very little by fly-by-night concerns, and it seems to us that our objections to HR 602 are founded on fact.

We suppose, however, that this may be only the first of a new rash of proposed legislation aimed at the pesticide trade. Let's hope that members of the new Congress will look at potential new laws objectively and fairly.

A Guide to the Future . . .

Guest Editorial Written Especially for This Issue of Agricultural Chemicals

Efficient Use of Fertilizer

by

Paul T. Truitt

President
American Plant Food Council, Inc.

THE more efficient use of fertilizer is essential not only in a sound land management program, but definitely is in the national interest.

Fortunately for farmers and consumers alike, "More Efficient Use of Fertilizer and Lime" has become a nation-wide program, conceived and promoted jointly by the Land-Grant Colleges and the U. S. Department of Agriculture. More important is the ultimate success of the program, the goal of which is to increase the production of food and fiber, build up the fertility of our land and increase the net income of farmers.

At a time when agricultural income is declining and costs of farm labor are becoming of increasing concern, farmers must use more and more with maximum effectiveness, all the available "tools of production" — tools that will enable them to produce more economically and at the same time to meet their increased responsibilities for needed crop and livestock production. That means, inevitably, *more efficient use of fertilizers.*

Efficient use of fertilizer, however, may not always mean using *more* fertilizer. But the fact remains, experiment station recommendations in most states already call for the application of about twice as much fertilizer as is being used.

Of course, there is no one solution for the problems of agriculture, but certainly that of maintaining, replenishing and increasing the fertility of our soils must be solved if we are to continue living in an agricultural economy of abundance. So, to the exent that farmers can produce economically and abundantly, the national program of the Land-Grant Colleges and the Department should have the active and enthusiastic support of farmers, their leaders, the industries that serve them and the public at large.

In focusing attention on the efficient use of fertilizer, we really are turning the spotlight on the future of a successful farming formula — a formula that not only includes the proper use of fertilizers, but all the factors that enter into sound land management. Just how well the formula will be applied is linked inseparably with the initiative and diligence of the individual farmer — on how well he hitches to the plow the practical findings of agricultural research.

The Land-Grant Colleges and the Department are pointing the way to a better agricultural tomorrow. They merit the support of fertilizer manufacturers as they go about the task of building a strong agricultural structure. The industry is expanding fast to provide the kind and quantities of plant foods necessary for an agricultural independence that will enable the United States to continue to be the best fed, best housed and best clothed nation in the world.

Issues Involved in

Pesticide Legislation

by
Dr. F. C. Bishopp

Assistant Chief, Bureau of Entomology and Plant Quarantine
Agricultural Research Administration
United States Department of Agriculture

AMONG the important issues involved in pesticide legislation, are (1) the adequacy of existing Federal legislation, (2) the adequacy of existing State and local legislation, (3) the practicability of enforcement of laws, and (4) the effect of legislation on the health and general welfare of our people.

The last issue is concerned with the protection of the public from health hazards associated directly with the use of insecticides, the protection of public interests by encouraging production of an abundance of high-quality food and fiber, the influence of legislation on scientific research and development in the pesticide field and also on the general acceptance of safe and effective use of pesticides. The health hazards will be discussed first, as they have a vital bearing on the other three.

Adequate wholesome food is admitted to be essential to health, even by those who would prefer to raise their food by the "organic method" and by those who are fearful of slow death from insecticide residues.

Despite such fears, some of the greatest health hazards throughout the world are the insectborne diseases. Today in all quarters of the globe, the use of insecticides is checking the ravages of malaria, yellow fever, typhoid, dysentery, and other diseases that have brought death and misery to millions of people. The health work of the World Health Organization, the Food and Agriculture Organization, and other agencies is also materially increasing food production so essential in many of the densely populated areas.

No Deaths from Residues

ON the other side of the ledger what do we find? Not a single authentic case of illness or death due to insecticide residues! Some 370 cases of illness or dermatitis and 14 deaths reportedly due to DDT have been assembled by the Committee on Pesticides of the American Medical Association. It must be emphasized, however, that these reported cases were neither investigated nor confirmed, and most of them (285) were due to accidental or intentional ingestion of the chemical or perhaps of straight kerosene.

Unfortunately, there have been 10 or 12 deaths of formulators or operators from the careless handling of the highly poisonous phosphorus insecticides such as parathion or TEPP. Although we deeply regret such preventable occurrences, we must remember that there were 12 deaths in 1949 from the ingestion of furniture polish and 31,701 people were killed in automobile accidents last year. That is too bad, also, but do we stop polishing furniture or using automobiles? No! Their use is increasing, even though they are less essential than food.

In addition to adequate wholesome food, clothing and housing are essential to good health, productive capacity, and happiness. It has been abundantly demonstrated that without the use of insecticides, these basic necessities of life would be jeopardized. Take away all insecticides, and crop failures would result in many large areas. In bad boll weevil and bollworm years, the cotton crop would be cut so much as to create a critical shortage of feed and fiber. In frequent seasons we would find ourselves with serious shortages of potatoes, beans, cabbage, and other vegetables. Apples, pears, peaches, citrus, and many other protective foods would be scarce and often of unmarketable quality.

What about meat, wool and milk? Protection of livestock from insects, ticks, and mites, by the use of insecticides is a basic requirement in the production of the essentials of life. And without insecticides, the already dwindling supplies of mer-

*Presented at the National Cotton Council of America, Cotton Insect Control Conference, Memphis, Tenn., December 10-11, 1952.

chantable timber and paper pulpwood would be reduced rapidly.

Wormy fruit and vegetables, moth-eaten clothes and weevily flour and meal would be the order of the day if insecticides were not readily available and freely used. Shall we lower our standard of living? In reply, there are some who would say that the destructive effects of insects and plant diseases are being exaggerated. Some crops do very well without pesticides, especially if other methods of control are fully employed. The latter is certainly true, but leading orchardists and gardeners tell us that if all control with insecticides were stopped, commercial production of many crops would be impossible and in a few years orchards would cease to bear and trees would be killed. The fact that today there are many orchards, is largely because of pesticides. Much of our fruit and vegetables is not from backyard gardens, but from commercial plantings that must return profits or cease production.

Already there is complaint about insect contamination of stored and processed products, to the extent that this trouble appears to overshadow the problem of food contamination by pesticides! The number of seizures and criminal-action cases reported by the Food and Drug Administration in its Notices of Judgment indicates this is true. In one of these reports covering the period from February 1 through September 1951, not a single instance of insecticide residue is included among the 350 cases listed. On the other hand, 260 of these cases were on or included charges of adulteration because of the product containing "filthy substances," among which were listed insect parts, insect excreta, maggots, mites, and rodent excreta.

It is probable that those interested primarily in control of cotton insects may fail to see the connection between this and the use of pesticides on food crops. It should be remembered, however, that the interests of the cotton grower are completely bound up with those of farmers producing crops other than cotton. Many of the problems arising from the use of insecticides are similar regardless of the type of crop. The development of new and improved pesticides — and the availability and cost of standard materials are governed by their use in all fields. Furthermore, cotton is an important food and feed crop, and already the question of possible contamination of cottonseed products by certain insecticides applied to the growing crop has been raised.

Undoubtedly, insecticides can be used on cotton and in soils where cotton is grown with fewer hazards than on many other crops. In fact, many insecticides are registered for use on cotton and employed extensively on that crop before they are permitted on other crops. Cotton raisers are fortunate in this respect, and they often serve as a proving agency for new chemicals from the viewpoint of both effectiveness and safety.

Despite the fact that there may be greater freedom in use of insecticides on cotton than is permitted farmers producing other crops, cotton farmers are equally concerned with restrictive legislation. In the first place, cotton growers find it necessary to use tremendous quantities of many pesticides to produce a satisfactory crop. For example, during 1951, the estimated quantity of insecticides required to make the 15,144,000 bales of cotton produced that year was 845 million pounds of field-strength materials. Furthermore, crops other than cotton are grown including those raised in rotation with cotton.

All Insecticides Toxic

IT must be accepted that insecticides are poisonous — some more, some less. It is therefore obvious that laws to govern their use are necessary. It also appears that in the interests of effectiveness and economy, our main dependence should be placed in Federal legislation.

Let us look into the adequacy of Federal controls now operating to protect farmers and the general public in the use of insecticides. The Insecticide, Fungicide, and Rodenticide Act passed by the National Congress in 1947, is administered by the Insecticide Division, Livestock Branch, Production and Marketing Administration, U. S. Department of Agriculture. This Act requires all insecticides to be registered before they can be shipped interstate. When the Act became effective, materials that had been shown by years of practical use to be safe and effective were accepted for registration. Before registration of a new chemical is permitted, not only are ample data on its effectiveness required but also pharmacological data. If the material is intended for use in such a way that it might contaminate foods, or if people are likely to be continuously exposed to it, a thorough pharmacological study is required. Such a study usually includes the effects of ingestion of small amounts over long periods, inhalation and skin absorption studies, as well as acute-toxicity tests on a number of species of animals.

This Act requires that all insecticides be labeled properly. The label must bear full information on uses and precautions to be followed; if the material is highly poisonous it must be marked "Poison" and the label must display the skull and crossbones, and also give antidotes.

A pesticide is not acceptable for registration by the U. S. Department of Agriculture if its composition does not warrant the proposed claims for it. The product and its labeling must also comply with other provisions of the law, including those on adulteration and misbranding.

A product is considered misbranded if —

(1) When used as directed it is injurious to living man or other vertebrate animals, to vegetation, or to the applicator.

(2) The labeling does not contain directions for use which are necessary and, if complied with, adequate for the protection of the public; or,

(3) The label does not contain a warning or caution statement which may be necessary and, if complied with, adequate to prevent injury to living man and other vertebrate animals.

The Act provides for registration of a product under protest. This provision may be objectionable. Out of 36,000 pesticide formulations registered, however, only about a half dozen have been registered under this provision, and only one product so registered has been offered for sale and it presented no harmful-residue problem. Registration under protest is such a severe handicap to the sale of a product that it is doubtful if such registration will be undertaken often.

The Act also provides for fines and imprisonment of the registrant if a product so registered is found to be in violation of the law. Multiple seizure of a product in a libel proceeding prior to marketing is permitted if the material is found unsafe for its intended use.

Under the specific authority of this Act, the Insecticide Division of the Production and Marketing Administration cooperates closely with various State and Federal agencies in carrying out its provisions. In this work it maintains close liaison with the Food and Drug Administration, the U. S. Public Health Service, the Bureau of Entomology and Plant Quarantine, and other Bureaus of the Department of Agriculture. In administering the Act, the Insecticide Division has been zealous in its efforts to protect the public from the standpoint of the effectiveness of a product and especially with respect to all hazards involved in its use.

The Federal Trade Commission exercises control over exorbitant and unwarranted claims in advertising. Under regulation of the Insecticide Division, the work of the Federal Trade Commission is supplemented. As defined in this regulation, labeling includes any advertising that makes claims differing from those made at the time of registration.

The Food and Drug Act passed in 1906 was administered by the Department of Agriculture and was designed mainly to prevent food adulteration. The whole matter of insecticide residues was considered in 1938 when the Food, Drug, and Cosmetic Act was passed. An amendment to this Act transferred the authority for its enforcement to the Federal Security Administration on June 30, 1940. This Act in Section 406 (a) directs the Federal Security Administrator to limit, by regulation, the quantity of added poisonous and deleterious materials, including pesticides, which may remain on any food "to such extent as he finds necessary for the protection of public health." Under this Act, a food is adulterated and subject to seizure if it contains any quantity of a poisonous or deleterious substance in excess of that established by the regulation.

B.E.P.Q. assistant chief calls for establishment of tolerances for toxic residues. These would serve as guides in making and executing recommendations for agricultural pest control

In January, 1950, the Food and Drug Administration began a hearing for the purpose of gathering information upon which to base the establishment of tolerances on residues of various pesticides on fresh fruits and vegetables. This hearing, which continued until September 15, 1950, covered in detail every aspect of the residue problem relating to fresh fruits and vegetables and set a pattern for all foods.

The only tolerances set by the Food and Drug Administration thus far relate to arsenic, lead, and fluorine. In 1927, the Food and Drug Administration set a tolerance of 0.025 grain of arsenic trioxide per pound of apples or pears. On several subsequent dates, as the degree of hazard became more fully recognized, this level was lowered until 0.01 grain per pound in 1932 was set and is now considered a "world tolerance."

Lead, which was extensively used in the form of lead arsenate and became recognized as presenting greater hazards than arsenic, was given a tolerance of 0.025 grain per pound in 1940. At the same time a tolerance of 0.01 was set on fluorine. Later, because of a technicality, this fluorine tolerance was set aside by a Federal circuit court.

The practicability of conforming to these tolerances has been fully demonstrated. The establishment of tolerances, or safe levels, of residues of all insecticides likely to find their way into foods is of great importance from the standpoints of the public, the entomologist, and the farmer. Such tolerances would give all concerned a safe target, or ceiling, as a guide in making and carrying out recommendations regarding formulations, number and time of applications, handling and utilization of crops, and disposal of crop residues.

FDA Hearing Duplicated

DESPITE the searching inquiry made by the Food and Drug Administration in its hearings, Congress authorized and appointed a House Select Committee to Investigate the Use of Chemicals in Food Products (Delaney Committee). This committee, with James J. Delaney of New York City, chairman, held intermittent hearings from September, 1950 through March 6, 1952. This inquiry dealt with all sorts of cosmetics, food additives, fertilizers, and pesticides. Testimony regarding chemicals put into foods for such purposes as coloring, preserving, and enhancing flavor or appearance of foods was thoroughly mixed up with that relating to pesticide residues.

In the opinion of many scient-

(*Turn to Page* 137)

Use of C-47 Airplane for Baiting and Spraying

NEED for large aircraft to disperse poison bait was first recognized in 1948 by the development of a severe grasshopper infestation on range lands. Grasshopper populations had been on the increase since 1945, and surveys showed that a severe outbreak was imminent in 1949. Over 30 million acres in Wyoming and Montana were seriously infested, and damage to winter range necessitated the movement of several thousand head of cattle to other feed areas or to market. Grasshopper migrations were also damaging crop lands.

The expected infestation in 1949 and the development of an effective dry bait that would flow freely from aircraft mechanisms suggested the possibility of equipping a C-47 (Air Force type of DC-3) for this work. This type of aircraft had been used during the war to spray mosquito-infested South Pacific islands and occasionally since that time to spray areas in this country for the control of forest pests; but it had not been used previously on a large scale for spreading bait. Under conditions of effective use against grasshoppers, bait was much more economical than were the liquid sprays available at that time. The usual type of commercialllly available bait-spreading aircraft was capable of carrying a load of no more than from 400 to 600 pounds. With the time for control short and the ferrying distances long, need for a larger, faster airplane was indicated for the work projected for 1949.

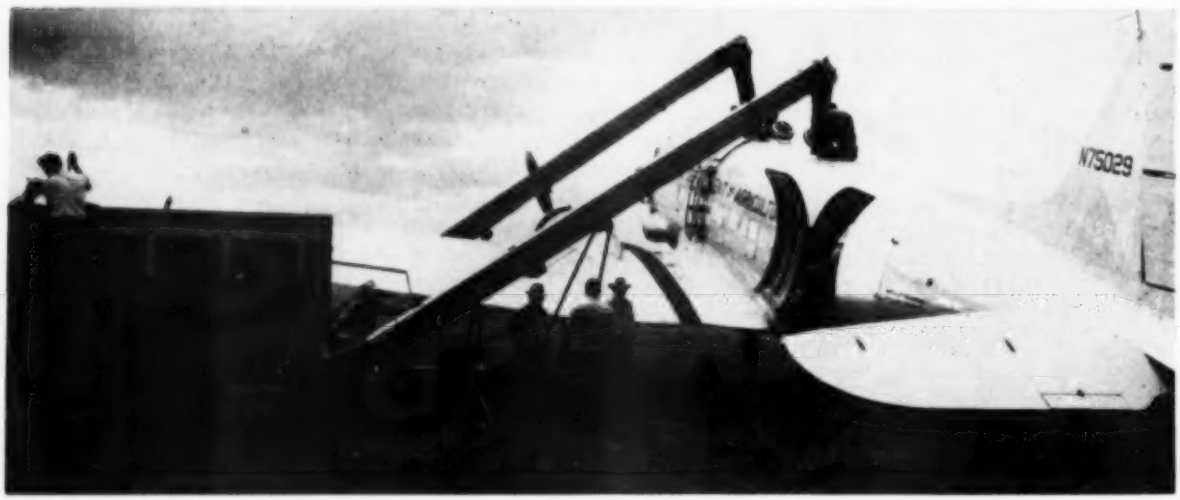
Above: Flying from 100 to 300 feet above grasshopper-infested range lands in Wyoming, the C-47 spreads bait at rate of 300 pounds per minute. Two 3-man crews allow coverage of 20,000 acres in one 14-hour day.

Below: Double elevators load plane with bait which had been mixed at a near-by station and hauled to airport in trucks. Four tons of bait can be loaded in 10 minutes.

Bait-Spreading Equipment

PLANNING modifications of a C-47 to disperse dry-bran poison bait began in November, 1948. It was desired that the aircraft accommodate the maximum bait load that would conform to safety requirements and that the loading equipment be designed to fill the hopper in the shortest practicable time.

The bait formula consisted of



by

Kenneth Messenger

U. S. Department of Agriculture
Bureau of
Entomology & Plant Quarantine

ward end, and passes through it, forcing the bait out of the after end. The outlet of each duct extends downward and outward through the bottom of the fuselage just below the floor, underneath the cargo door. The hopper is partially divided into four compartments of nearly equal size, by baffles designed to keep the load from shifting during takeoff. Its total capacity is 585 cubic feet, large enough to hold approximately 8,000 pounds of dry bran bait; loaded into the hopper through four hatches in the top of the fuselage. Two portable endless-chain elevators, operating simultaneously, load the plane in 10 to 13 minutes.

To prepare the airplane for the installation, the bucket seats and support brackets, and other installations were removed to reduce its weight by some 614 pounds. The material used in the installation weighed 1304 pounds, thus, the net weight added to the aircraft as a result of the conversion was 690 pounds.

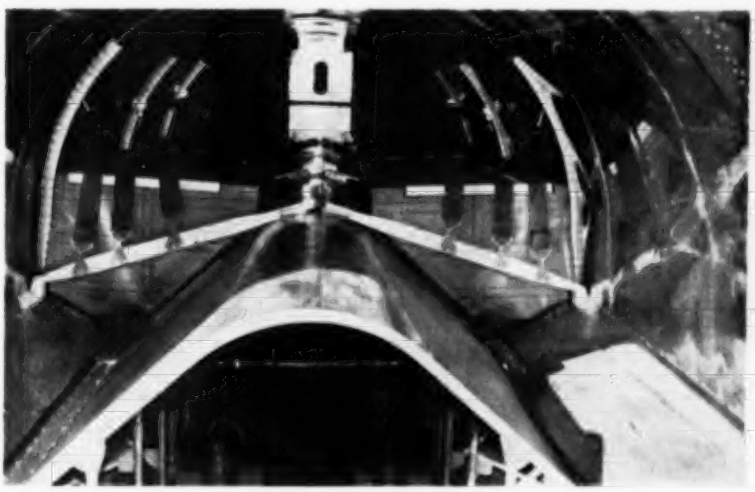
100 pounds of coarse wheat bran lightly impregnated with 2 quarts of kerosene containing 1 pound of toxaphene or ½ pound of chlordane.

After a careful study of requirements and seeking the advice of engineers in related fields, a definite design was decided upon and turned over to the Navy Department. The engineering details were worked out, in cooperation with representatives of the Bureau of Entomology and Plant Quarantine; and by engineers attached to the U.S. Naval Air Station, Corpus Christi, Tex., where the installation was made.

There was neither time nor facilities for preparing working drawings, so a few sketches, made before the work started and during its progress, provided the shops with certain basic information; but most of the instructions were given orally. Because the installation is for a special purpose and not likely to be widely duplicated, the expense of complete working drawings has not been considered justified since.

General Description

THE bait hopper is approximately 23 feet long. The bottom is formed in the shape of a W. At the bottom of each of the two troughs thus formed, a metering valve or shaft, extending the full length of the hopper, is rotated to feed the bait into a longitudinal air duct. Air is scooped into this duct at its for-



Upper photo: View of bait hopper, showing baffles and rear end removed in order to install pesticide tanks. Crawlway and manifolds are shown at the bottom of the picture.

Lower photo: View of crawlway beneath hopper, showing large air tubes used for discharging bait, and pesticide tank outlets leading into manifolds. A hydraulically-driven pump is attached to the center section of each manifold to discharge the liquid pesticide through the booms and nozzles located below the wings. This view shows the rear ends of manifolds turning downward. They extend through the belly of the fuselage where the opening of hydraulic valves, controlled from the cockpit, permits the emergency discharge of an entire load of pesticide in approximately one minute.

Bait Hopper

EXTENDING from the transverse forward bulkhead, the hopper reaches aft to the forward jamb of the cargo door. The sides and top are constructed of sheet aluminum and the hopper walls extend downward on both sides to the bottom of the windows. The space between this metal liner and the skin of the fuselage is filled with insulating fiber to reduce transmission of heat into the oil-impregnated bait. The W-shaped bottom of the hopper slopes at an angle of 45 degrees to permit the flow of bait by gravity into the metering valves. This shape also provides a crawlway underneath the hopper for the crew, approximately 3½ feet wide by 3½ feet high.

Metering Valves

METERING valves, as the name implies, are both meters and valves, serving to transfer bait from the hopper into the air ducts at the desired rate and prevent bait from falling into the air ducts while ferrying.

These valves are located immediately underneath the two troughs formed by the lower apexes of the W-shaped hopper bottom. Made of duralumin, they are approximately 23 feet long, supported by bearings at each end and at three intermediate points.

Six flanges, or vanes, are attached to each shaft, parallel to its axis. They are made of Neoprene strips 1¼ inches wide and ⅛ inch thick. This flexible, aromatic-resistant material provides a positive seal, or valve, with minimum friction. It also makes the accidental presence of foreign objects in the bait less damaging to the metering mechanism. These flanges are divided longitudinally into four sections, positioned in a circumferential sequence, so that bait is not dropped into the air duct simultaneously from all sections of the hopper. Thus the possibility of clogging the air duct with bait is reduced. After the bait has been dropped from the rear section of the hopper, the metering valve turns 13 degrees before the bait from the next section is released, and so on until the bait from the front section is released.

Each metering shaft rotates within and is housed by a tube, open at the top to allow the bait to bear on the shaft and fill the voids between the flanges. The housing is also open along the bottom to permit the bait to fall into the air duct below it when the shaft is rotated.

An additional hydraulic pump is mounted on each of the two engines, and operates independently of the plane's regular hydraulic system. Two small motors, propelled by one or the other of these hydraulic pumps, drive the two metering shafts through chains and sprockets connected to the center bearings, thus reducing the torque. A flow equalizer is installed ahead of the hydraulic motors so the valves will turn at the same speed. A tachometer for each metering valve is located in the co-pilot's instrument panel.

A needle valve is used to control the speed of the metering valves, which can be rotated at any speed up to approximately 25 r.p.m., depending on the rate of bait discharge desired. (At the usual rate of application, 10 pounds per acre, they rotate at 12½ r.p.m. and discharge 600 pounds of bait per minute.) Should one metering valve become jammed, an emergency hydraulic valve can be opened to allow the fluid to bypass the flow equalizer; and if the hydraulic-drive system should fail, the hopper can be emptied by rotating the metering valves by hand.

Air Ducts

SCOOPS at the forward ends of the air ducts are approximately 18 inches behind the propeller tips. They receive and conduct air into ducts inside the fuselage. The cross-section area of each air scoop is 6 per cent greater than that of the forward end, to increase the pressure and velocity of the air in the duct.

The ducts lie on the floor beams of the fuselage directly under the metering valves. Each duct at its forward end is 13½ inches in diameter. While its height remains constant throughout its length, the width increases in the direction of the air flow, being 1.6 times wider at the back of the hopper than at the front. This arrangement provides for the absorption of bait into the air stream within the duct and reduces restriction of the flow of air and bait at the rear end of the duct.

The protruding sections of the exhaust ends of the air ducts are at an angle approximately 35 degrees outward and 45 degrees downward. They are cut off at right angles to their axes. This creates a resistance to air flow, increasing the negative pressure within the tubes and thus the velocity of air flowing through them.

Loading Hatches

THERE are four round loading hatches about 13½ inches in diameter in the top of the fuselage—one over each section of the hopper. They were spaced so that it was not necessary to cut any of the structural formers of the fuselage. The lids are hinged at the front so that they will remain closed in flight and a small vent in each lid maintains air pressure within the hopper.

Performance

THE airplane has been used satisfactorily to disperse both the straight bran bait for which it was designed and also rolled wheat bait, made up of coarser and larger particles. It could also be used very rapidly for the seeding of range and crops or for a number of other purposes. When flying without cross-wind at an altitude of 400 feet, a good coverage of bait is usually obtained on a swath 200 feet wide.* When flying at a speed of 150 mph and applying 10 pounds of bait per acre, a load of 7000 pounds** covers 700 acres in approximately twelve minutes.

(*Turn to Page* 133)

* As cross-winds arise this swath is maintained by reducing the height of flight.

** In actual operations the load is sometimes reduced when the work-area altitude increases, when terrain is rough, when runways are rough or soft or when temperatures are high.

Soluble Plant Food

CONCENTRATES

by
Milton A. Lesser

CONSIDERABLE interest has been displayed of late in the potential market for soluble plant food concentrates. While other more spectacular developments have held the agricultural headlines, these specialized plant nutrients have caused a minor revolution in garden and greenhouse care and have begun to attract the attention of fertilizer producers.

Facilitating the task of the gardener by permitting him both to water and fertilize his plot simultaneously, the concentrated plant nutrients currently command only a small part of the total fertilizer sales. Nonetheless, there is a great potential market for these horticultural specialties. This was indicated recently in F. B. Turck's article in the September, 1952, issue of the *Scientific Monthly*. Here he called attention to the fact that in 1950 the American people spent 129 per cent more for flowers and seeds than in 1940. This, of course, points directly to the growing greenhouse and garden market.

More specifically, it has been estimated (1) that there are nearly 17 million potential customers for these soluble plant foods among the nation's garden enthusiasts. In addition, increasing quantities of such preparations are being consumed commercially because greenhouse keepers find them quite convenient.

Although some of these newer preparations are formulated for rather specialized applications, in general, most of them are designed to provide balanced nutrients for flowers, shrubs, potted plants, trees, evergreens, vegetables, lawns, and vines. By varying the amounts of materials used in preparing the final solutions, certain of these compounds may also be employed as transplanting starter solutions for plants and seedlings. Other mixtures, in addition to their employment on soil-grown plants, may be adapted for use in water (tank), gravel or sand culture (e.g. hydroponics).

Principle Long Known

ACTUALLY, the principle behind the modern soluble plant food concentrates is not new. The same idea has been utilized in the field of hydroponics and in the preparation of starter solutions. About 15 years ago, Sayre (2) reported on the use of nutrient solutions for transplanting tomatoes. He (3) subsequently observed that fertilizer manufacturers had prepared some of these "special transplanting mixtures" for the convenience of growers.

Today, because they stimulate earlier growth and increase yields, starter solutions have a well established place in agriculture. Not only are they used with tomatoes, but they are also being recommended for employment with tobacco, cauliflower, peppers, cabbage, and other types of transplants, including floral plants, for which the starters have been found to be highly beneficial. According to one bulletin, (4) starter solutions are likewise employed in blueberry propagating beds and in planting strawberries.

The growing popularity of the soluble nutrient concentrates is attributed to their advantages and conveniences not only for the home gardener, but to the commercial planter as well. Among the advantages of liquid fertilizer made with these concentrates are: high concentration of nutrients, quick availability to the plants, and ease of handling and application.

For example, when such mixtures are used to prepare starter solutions, their quick and complete solubility eliminates long and tiresome stirring and greatly lessens the possibility of clogged equipment.

When used in the greenhouse or in the field, the principal effect of a starter solution on a transplanted crop is that the solution stimulates root development and enables the crop to become established quickly. This, as noted by Sayre, (5) results in earlier maturity and larger yields.

Nutrient solutions are being used extensively in greenhouses because of their labor-saving features and other advantages. According to Seeley, (6) the application of nutrients in solution is an efficient method of fertilizing bench crops and pot plants. Fertilizers, he points out, can be applied more quickly and more uniformly in solution than when dry. The nutrients, being in water solution, are immediately available to the plants. Moreover, fertilization and watering can be done in one operation. The nutrient solutions may be applied with the spray tank, through fertilizer or spray pipe lines or by means of specially constructed, movable tank and pump units. It has been stressed (7) that the liquid fertilizers should not be applied to dry soil because of the possibility of damaging the roots.

Studies (8) on the use of these liquid nutrients on greenhouse bench and bed crops have shown conclusively that frequent application of these relatively dilute fertilizer solutions will minimize the need for soil testing. Fluctuations in the nutrient content of greenhouse soils are thereby lessened.

Post (9) is "highly in favor" of concentrated chemical fertilizers that are dissolved in water for commercial and amateur gardener use. He observes that the liquid application of concentrated fertilizers gives a more uniform distribution of the material and provides a supply of fertilizer in immediately available form.

These considerations, plus the fact that the modern plant food concentrates are practically odorless and convenient to use, are important elements in the appeal of these products to the small or amateur gardener. (1) Sold as powders, liquids or tablets that permit easy regulation of dosage or concentration, the solutions can be applied by means of a pail, watering can, sprayer, or special garden hose attachments. Such attachments are now being supplied by some of the concentrated plant food makers. Probably liquid fertilizer applicators, as described by Link, (10) can be used for larger areas, such as public parks and the like. Such equipment, he says, cuts the requisite time considerably and no burning of the plants has resulted from the use of the solutions.

This authority (11) calls attention to the need for regulating the concentration of the solutions and the frequency of application according to the consistency of the soil. Also noteworthy is Everett's (12) advice that if the soil is distinctly dry, it should be soaked with water for a few hours before applying liquid fertilizers.

Spraying Fertilizers

OF particular importance in connection with the application of plant nutrient solutions are data which indicate that, in addition to feeding via the roots, many plants can absorb nutrition from sprayed liquid fertilizers by way of their leaves and branches. Thus, in a report on foliage feeding, Arny (13) noted that tissue feeding, or feeding through the leaves instead of the roots, is not essentially a new technique; having been used experimentally for some time. He called attention to rather extensive tissue feeding tests in Florida in which good results were obtained with several kinds of vegetables.

Arny's report, however, was particularly concerned with carefully controlled foliage feeding tests on roses, in which a solution prepared from a commercial nutrient mixture ("Hy-Gro") was used as a spray. In these tests it was found that the sprayed plants produced 21 per cent more bloom than the unsprayed plants and attained about 12 per cent greater plant growth. Moreover, the blooms were of equal if not slightly better quality on the sprayed plants.

Also highly indicative is Pirone's (14) comprehensive discussion on the foliage application of nutrients. He called attention to the fact that both amateur gardeners and professional arborists and nurserymen are now using this relatively new method of supplying nutrients to trees and shrubs and, in the main, are getting "excellent results." They have found the method to be sound, practical and necessary or desirable under certain conditions. On the basis of his own and other investigations, Pirone predicted that the foliage feeding method with nutrient solutions would increase in use and popularity.

More recently, in studies involving the use of radioactive isotopes of potassium, phosphorus and carbon, Tukey and his associates (15) found that the stems and branches of woody plants can take up nourishment if the fertilizing material is sprayed upon them. From their findings, these workers believe that so-called "foliage feeding" must take into consideration other portions of the plant such as the trunk, branches, and shoots, as well as the foliage.

Of course, there are those who feel that the soluble plant food concentrates have certain shortcomings and that their value has not been fully established, except perhaps in starter solutions. Others (7) feel that the cost, especially in larger scale use, is rather high. However, a number of factors enter the economic picture. These include the concentrations used, the frequency of application, and the cost of the ingredients. (1)

More extensive use of these preparations will no doubt reduce costs. This outlook is encouraged by continued research that is confirming the value of the nutrient solutions. For example, recent studies (8) have demonstrated that nutrients applied with enough water to carry them to plant roots are rapidly absorbed and translocated through plants in a few minutes to regions where they are used for growth processes. This has been shown through the addition of radioactive phosphorus to liquid fertilizers. With such a procedure, it was found that within 15 minutes

after the liquid fertilizer was applied to the soil around chrysanthemum plants, the radioactive phosphorus could be detected in the tips of the stems nearly two feet above the ground. Similarly, within half an hour after application of the fertilizer solution to the soil in which tall, greenhouse rose plants were growing, the radioactive phosphorus could be detected in flower buds six feet above the bed.

As with other types of fertilizers, the soluble nutrient concentrates must comply with state control laws with respect to labelling and guaranteed plant food analysis. Thus the proportions of available primary plant foods are expressed, as usual, in terms of percentages of nitrogen, phosphoric acid and potash.

Similarly, they must meet the basic requirements of a good quality fertilizer. (16) They should not cause injury to the plants when applied in the usual manner nor leave any harmful residual effect on the soil, but they should contain the nutrient elements in the correct balance. In addition, the soluble concentrates must have certain fundamental characteristics of their own. Primary requisites are that the raw materials should be completely soluble and that they should be compatible. (17) It is also desirable that the formulation be adjusted to the particular soil nutrient needs of the locality. In this respect, the local manufacturer or fertilizer supplier has the advantage of being able to "tailor" the plant food compositions to the exact strength required in his area.

Manufacturing Problems

BECAUSE of the requisite of complete water-solubility, the range of available raw materials for making the soluble concentrates is more limited than for other types of fertilizer. Thus, to avoid precipitation of phosphorus because of incomplete solubility, many formulas make use of monoammonium phosphate, diammonium phosphate or potassium phosphate. The less soluble and also less expensive superphosphates cannot be used in such preparations. (7)

Complete solubility in water a requisite for such special plant food formulations. Range of raw materials is more limited, however and they are more costly to make

In addition to these high grade soluble phosphates, other chemicals commonly employed in soluble nutrient concentrate formulations include potassium nitrate, sodium nitrate, potassium chloride, and urea. (18) Ammonium nitrate and ammonium sulfate have also been used in liquid fertilizers. (6) Obviously, some of these raw materials supply more than one primary nutrient. Potassium phosphate, for example, builds potash and phosphorus values, while the ammonium phosphates supply both nitrogen and phosphorus.

Urea has come in for increased attention as a source of nitrogen for the soluble nutrient concentrates. Not only is it absorbed via the root system from the soil, but it has also proved to be effective as a nutrient in sprays for foliage feeding. (1,14) In some formulations, especially liquid preparations, part of the nitrogen is supplied in the form of organic materials, such as fish solubles and various extracts. For example, in one liquid plant food ("Ortho-Gro"), with a 10-5-5 formula, the nitrogen is supplied from fish and urea.

Although chemicals supplying one or two primary nutrients are employed in greenhouse practice and for correcting garden soil condition, the modern soluble plant food concentrates are complete fertilizers; providing nitrogen, phosphorus and potassium. While some preparations may be used interchangeably (by varying the concentration of the solutions) for soil application, foliage feeding or transplantation, the fertilizers are often formulated for rather specific purposes.

For example, as noted by Purvis, (18) mixtures having a high phosphorus content are normally used in starter solutions. Typical are mixtures with the following formulas: 13-26-13, 15-30-14, 8-24-8. These are used at the rate of 3 pounds in 50 gallons of water, one-half pint being applied to each plant. These starter solutions may be run into the lines when the crop is irrigated. (4) Purvis also points out that more balanced mixtures, such as 16-16-16 composition, are employed for complete fertilization.

According to Seeley, (6) similar compositions may be used to make liquid fertilizers for the greenhouse. For this purpose, 15-30-15 or 13-26-13 formulations are used at the rate of 3 to 4 pounds per 100 gallons of water. In the greenhouse investigations (8) previously cited, three pounds of a 12-12-12 or a 12-24-12 combination was dissolved in 100 gallons of water and applied to the bench soil at the rate of one quart per square foot.

Soluble food plant concentrates for garden use are found to vary considerably in their total nutrient content. As noted in one discussion, (1) many of these newer plant foods reflect the old standby formula of 5-10-5. One variation of this formula, a 6-10-4 mixture, is used by California gardeners. (19)

High Analyses Favored

THE current trend, however, is toward the production of more concentrated preparations; many of them falling into the high-analysis fertilizer class (*e.g.* containing a total of over 30 per cent of primary plant

(*Turn to Page* 130)

Control of Pink Bollworm Larvae In Large Steel Storage Tanks by

Methyl Bromide Fumigation

DURING the course of adapting methyl bromide fumigation to the treatment of bulk cottonseed to destroy pink bollworm larvae embedded in the seed, two very large bulks were fumigated in single operations. These fumigations were conducted at Waxahachie, Tex., and Oklahoma City, Okla., at oil mills where the cottonseed stock piles were quarantined and treatment was required when it was found that pink bollworms were present in areas where some of the seed originated. The amounts of cottonseed treated were 2,500 and 3,000 tons, repectively.

Table 1

Pressure and vacuum readings taken in fumigation tanks. Inches of kerosene.

Time of reading	Pressure at top	Vacuum at bottom
At Waxahachie, Tex.		
At start	7.0	23.2
Minutes after start		
½	8.8	23.6
1	9.6	22.6
2	11.8	20.6
3	13.0	19.6
4	13.8	18.8
5	14.2	18.4
9	14.2	18.2
10	18.4	15.8
15	23.2	10.4
25	28.8	—
At Oklahoma City, Okla.		
At start	12.2	25.4
Minutes after start		
½	12.9	25.0
1	13.4	23.4
3	15.9	22.0
6	18.7	18.8
10	20.7	17.1
25	24.4	13.7
60	25.6	12.2

Table 2

Results of gas analyses to determine the distribution of methyl bromide in the fumigation of bulk cottonseed in a storage tank at Oklahoma City.

Sample No.	Distance, in feet From floor	Into load	Recovery, in ounces per 1,000 cubic feet 30 min.	3 hr.	6 hr.	10 hr.	20 hr.
1	10	20	54.0	26.4	14.8	10.0	4.4
2	10	10	65.4	27.2	15.6	12.2	8.6
3	20	10	—	36.8	34.4	25.6	22.8
4	40	20	—	28.0	30.4	34.0	23.8
5	Above load	—	26.6	24.8	22.2	21.2	17.2

Methyl bromide fumigation of bulk cottonseed in large steel storage tanks equipped with forced circulation was authorized under the pink bollworm quarantine in 1948.[1] At that time the largest tanks were 54,000 cubic feet (48 feet high by 38/2/3 feet in diameter), and held approximately 550 tons of cottonseed.[2] The forced-circulation system required for the fumigation was subsequently found also to prevent heating of the cottonseed, a constant problem in the storage of this product.

A cottonseed-oil company designed and built two 279,000-cubic-foot tanks, one at Waxahachie and one at Oklahoma City for the storage of cottonseed at oil mills located there. Except for the size, these tanks were almost identical to the smaller ones approved for fumigation purposes. The cylindrical portion of each tank was 60 feet high and 70 feet in diameter, and contained 230,907 cubic feet. The conical roof section was 35 feet high and contained an additional 44,898 cubic feet. A housing 10 feet high and 10 feet in diameter was mounted on the point of the cone, giving the structure an overall height of 105 feet. The housing ing contained a hinged bottom and a side door, which were sealed dur-

[1] BEPQ 555, revised June 11, 1948.

[2] Phillips, G. L., and Randall Latta. Current use of methyl bromide for the fumigation of cottonseed. *Down to Earth* (Dow Chemical Co.) 5 (1): 11-13 1949.

by
G. L. Phillips, J. S. Cook and W. M. Irvin
Bureau of Entomology & Plant Quarantine
U. S. Department of Agriculture

ing fumigation. A 6-by-6-foot tunnel ran through the center of the floor area and contained the conveyors for unloading the seed. The seed was loaded through the roof.

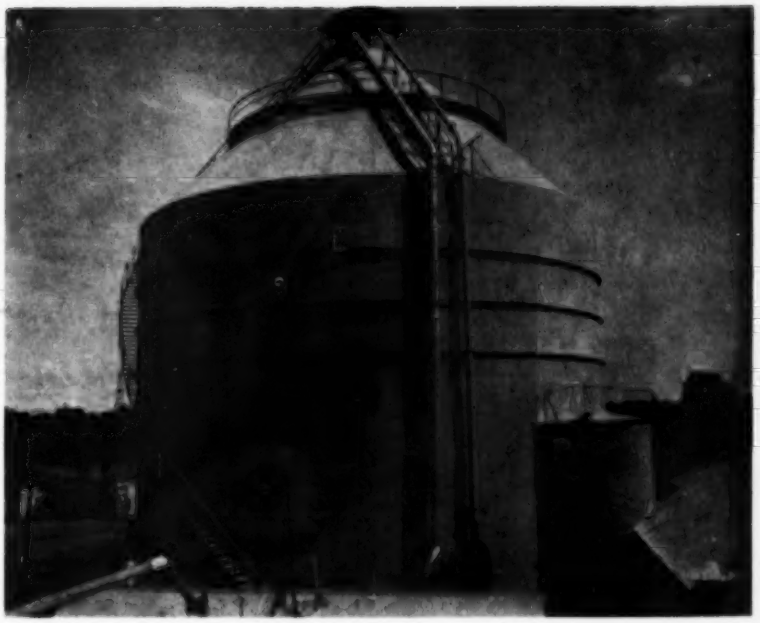
Each tank was equipped with a 60-inch blower, which withdrew air from beneath the floor and returned it to the head space above the load through a 15-inch gas-tight duct on the outside of the wall. There were two intake ducts, each attached to two ducts laid in the concrete floor of the tank, parallel to the conveyor tunnel. A number of 4-inch risers from these ducts opened at the floor level into inverted V-shaped wooden shields. The floor ducts were graduated in size as they approached the attachment to the intake duct.

Careful Preparation

BEFORE the fumigation was started, all outside openings were sealed by closing against rubber gaskets or by use of masking tape and caulking compound. It was indicated that rubber gaskets should be used on the top openings and masking tape and caulking compound on the outside of openings near the bottom, as pressure was created at the top of the load and a vacuum at the bottom.

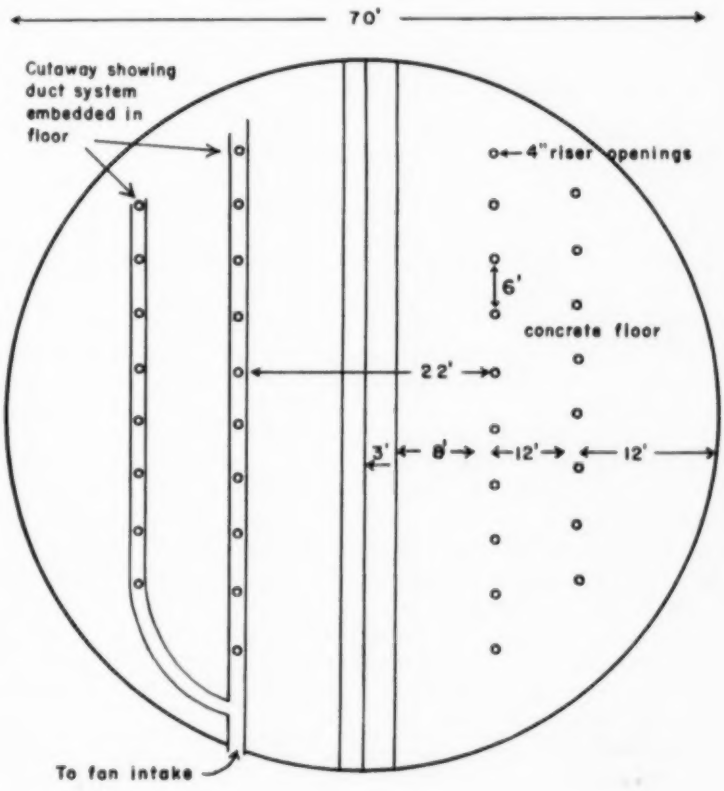
The methyl bromide was introduced into the return duct a few feet beyond the blower. At Waxahachie, eleven 105-pound cylinders were used, making a rate of 4.2 pounds per 1000 cubic feet, slightly more than the recommended 4-pound dosage. The cylinders were attached to a 1-inch pipe manifold so that three could be emptied at a time, which was about as fast as the methyl bromide

(*Turn to Page* 127)



Storage tank at Oklahoma City in which a 3,000-ton load of cottonseed was fumigated with methyl bromide.

Floor plan of steel storage tank, showing location of floor ducts and risers.



Manufacturers' Problems of Fungicide

by

Dr. J. B. Harry

Agricultural Chemicals Development
Fine Chemicals Division
Carbide & Carbon Chemicals Co.
New York, New York

FORMULATION problems begin for the manufacturer when research finds a new fungitoxic molecule. These problems to be encountered are legion in number, simple to enumerate, but, unfortunately, often extremely difficult to solve. This discussion will deal solely with their enumeration.

Actually, the objective in effecting disease control is not particularly complex, being merely that of applying a fungitoxic chemical at the right concentration in the right place at the right time. The mechanics of this procedure are very complex, however, involving interactions of chemistry, physics, and biology which are understood only very vaguely, if at all. The fundamental problem of formulation is that it is an art, rather than a science, with laws so poorly known that an empirical testing and trying is the only approach possible under the present state of incomplete knowledge. For this reason it is difficult indeed to interest those with an adequate physical-chemical background in the problem and the best formulation chemists today have gained their skill through long years of patient accumulation of experience.

The Chemical Itself

THE fungitoxic chemical itself introduces two problems of major import. (1) Its physical state, that is, whether solid, liquid, gas, or "gunk" will determine, in large measure, the formulation approach to be used, unless, by fortunate coincidence, the chemical has those physical characteristics enabling it to be handled easily as a spray or dust. The chromate-complex fungicides, *e.g.*, "Crag Turf Fungicide 531," "Crag Fungicide 658" developed by Carbide and Carbon Chemicals Company are examples of such compounds requiring no special formulation. By some perversity of nature, most of the really toxic molecules seem to fall in the "gunk" classification, that is, they are neither well-defined crystalline solids nor mobile liquids but viscous, amorphous substances, often difficultly soluble and responding to the strategems of handling neither as solids nor as liquids. Fungicides in the gaseous state are used only for very specialized applications, *e.g.*, soil fumigation and after-harvest fumigation for the control of storage and transit rots. Such will not be further considered in this discussion.

(2) The scale of production of the chemical whether laboratory, pilot plant, or full-scale commercial manufacture, greatly influences its physical properties and subsequent formulation. The initial laboratory sample is usually a fairly pure chemical prepared from reagent-grade raw materials and isolated by recrystallization. To be bioassayed accurately, this research sample must be formulated in some way so as to evaluate fairly its potentialities. When a large number of new chemicals must be screened for a wide variety of possible applications, any great amount of time simply cannot be devoted to developing finished formulations of chemicals, 90% of which may be of insufficient biological activity to be of further interest. Rightly or wrongly, research biologists screen on the premise that a really effective molecule will exhibit activity even if not formulated as efficiently as possible.

When initial screening tests have indicated promise for a given material and larger quantities are produced in pilot plant operations, biologists are sometimes dismayed to discover that the product often resembles its laboratory-prepared predecessor in one respect only—that of biological activity. Its color, odor, physical state, and handling properties are often so different that faith alone leads them to accept it as the same chemical. These differences occur as the result of reacting commercial, that is, less pure, raw materials in equipment not specifically designed to produce the chemical in question, often taking the product as a residue, unrefined by distillation or recrystallization.

Of course, any formulations developed with the preliminary sample simply will not work with the aberrant material and this problem must be faced again and again as production changes occur in either raw materials, processes, or equipment. When the product is finally produced on a full scale in a plant specifically designed to make it, its physical and chemical characteristics are often remarkably close to those of the material initially synthesized in the laboratory. But in the interim, development must be done with a product of varying characteristics and the formulation must be changed accordingly.

This is often a source of great discomfiture to experiment station cooperators who, understandably, prefer to work with materials of constant composition. It is an inescapable fact,

* Presented at Fungicide Colloquium, American Phytopathological Society, 44th Annual Meeting, American Institute of Biological Sciences, Ithaca, N.Y., September 9, 1952.

Formulation

however, that agricultural chemical development, like evolution, means continuity with change.

Spray Formulations

THE end use to which the toxicant is to be put, whether as a spray or as a dust, determines how it will be formulated. For spray applications, three approaches can be explored: (1) wettable powders, (2) solutions, (3) emulsions. Each has its problems.

Wettable powders are by far the most frequently encountered fungicide formulations, e.g., the familiar heavy metal dithiocarbamates, quinones, captan, etc. They can be prepared by (1) spray-drying, (2) blending with a diluent, (3) impregnation of a diluent wholly or in part, followed by blending, usually with a different diluent. A host of problems is encountered if all possible combinations of equipment, diluents, and adjuvants are explored. Smith (11) lists 21 major types of mixing equipment manufactured by 70 companies. Each of these will modify the formulation in a characteristic way which often cannot be determined in advance of actually processing a commercial batch. It is a very serious drawback that most of this mixing equipment is not available in scaled-down size so as to handle laboratory quantities of candidate formulations. As a consequence, large quantities of often very valuable toxicant must be committed to formulation studies using as widely varying types of equipment as can be obtained in order to determine the most efficient for the combination of toxicant and diluent desired. In actual practice, often the new material is made to fit formulation equipment already on hand and no real study with different processing machinery is made. As a result, in many cases somewhat less than the best formulation is developed for testing or sale.

The problem of a choice of diluent is a major one. Watkins and Norton (12) in 1947 described 14 major groups of diluents available as over 80 commercially distinct products, each different in chemical composition, specific gravity, pH, apparent density, particle size, particle shape, absorbtive capacity and cost. The list grows as new synthetic and modified, naturally-occurring diluents become available. There is perhaps no more misleading term than "inerts," as these diluents are frequently called, for they exert profound influence on the performance of the toxicant. Ideally, a new fungitoxicant should be formulated over a range of proportions with each of these diluents in order to determine the best material and the optimum proportion to use.

Once the choice of diluent and ratio of toxicant to diluent has been made, the communication of the resulting mix poses serious problems. There is a wide variety of grinding apparatus which can be divided broadly into two classes, either as mechanical or air milling. Such characteristics of the resulting grind (as wettability and average particle size) are influenced by each individual machine, even ostensibly identical models produced by the same company producing subtle but recognizably different formulations of aliquots of the same toxicant-diluent blend. The object of grinding is, of course, to reduce the particle size of the formulation, but there is very little information on the optimum particle size to be achieved generally and only a few fungicides have been studied specifically. (1, 2, 4, 6, 8, 13).

There is little agreement on just what is a reliable method of particle size measurement. In general, eight methods have been used as described by Schweyer and Work, (10). (1) sieve analysis (accurate only to about 44μ), (2) direct microscopic measurement (dispersing medium affects particle shape), or ultramicroscopic measurement (does not give particle size distribution), (3) sedimentation by increments or cumulatively (accurate to 1 or 2μ), (4) centrifugation by ordinary, super, or ultra centrifuging (substituting centrifugal force for gravity in a sedimentation determination), (5) elutriation (a kind of reverse sedimentation), (6) turbidometric (estimation by effect on light transmission and dispersion), (7) permeability (empirically related to specific surface and valid only for those materials where the relationship is clearly known), and (8) adsorption (most useful in studying particle surface and shape).

Application of these eight methods of measurement to a given formulation will not yield a single answer for either the average particle size or particle size distribution. Further, for any new toxicant and for most of the older ones, nothing is known about the optimum particle size required. This may be different for each chemical depending on its solubility, chemical stability, vapor pressure, and tenacity. Determina-

Formulation problems multiplied through sheer numbers of materials involved. Over 100 spray adhesives tested, and the prospect of evaluating with hundreds of other wetting & sticking agents at many concentrations, termed as discouraging

tion of the optimum particle size is tedious and time-consuming but potentially very rewarding.

Most wettable powder formulations do not consist solely of toxicant and diluent but one or more adjuvants are added in varying percentages as anti-caking agents, wetters, dispersants, deflocculents, and stickers. Some modification of the fungicide-diluent blend is almost always required either to increase its ease of handling or to modify the type of deposit secured. It is here that real formulation artistry must be exercised, since small amounts of adjuvants can affect the physical properties of the wettable powder and the number of modifying materials of potential value is legion.

While many attempts have been made to improve the weathering characteristics of spray and dust deposits, improvement through the use of adjuvants has been largely disappointing. Over 100 spray adhesives have been tested by Harry (5) but in the main, the increased cost of their use is not justified by corollary increases in disease control or crop yield. The prospect of evaluating combinations of dozens of anti-caking agents and deflocculents with literally hundreds of wetting, dispersing, and sticking agents over a range of concentrations is discouraging indeed. As a result, adjuvants are not investigated exhaustively by any means and such factors as availability, cost, and the first combination to perform satisfactorily determine the formulation of choice.

The formulation of fungicides as solutions is almost problem-free. Either the chemical is or is not water-soluble at use concentration. Miscible solvents may be of more help, although the toxicity of the solvent to both plants and animals, and its potential fire hazard must be considered. Solvent solution formulations must carry high concentrations of the toxicant to avoid the economic penalty of handling and shipping weighty, expensive diluent. The nabam fungicides are examples of truly water soluble materials and the glyoxalidine "Crag Fruit Fungicide 341" is water soluble by virtue of the miscible solvent, isopropanol.

The third alternative method of formulation of chemicals, as emulsions, has been used less with fungicides than with herbicides or insecticides. Two approaches are possible: when the chemical is a liquid, an emulsifier can be added directly to yield an emulsifiable concentrate; more commonly the toxicant is first dissolved at high concentration in a water-immiscible solvent to which the emulsifier has been added.

The choice of the emulsifier to use must be made from over 1000 commercially available materials produced by some 117 companies as listed by McCutcheon (7). These may be broadly classified into anionic, *e.g.*, soaps; cationic, *e.g.*, quaternary ammonium; and non-ionic, *e.g.*, polyoxyethylene fatty acid esters. Non-ionic emulsifiers are perhaps the most widely used since their efficiency is not affected by water-hardness or ions contributed from other sources. From the vast number of emulsifiers available, a choice must be made based on cost-efficiency with the toxicant to be emulsified. Two criteria for evaluation are used: ease of emulsification and the degree of emulsion stability desired. It is not easy to select the correct emulsifier. Griffin (3 p. 716) has aptly stated the problem, "The two major needs in emulsion technology are (1) a method of selecting a suitable emulsifier and (2) a universally accepted means of testing and evaluating emulsions."

Dusts

IF the fungitoxicant is to be used as a dust, much the same diluent and conditioner problems must be overcome as in formulating wettable powders. Miller (9) lists 14 factors affecting the performance of agricultural dusts: (1) particle size, (2) particle shape, (3) density, (4) flowability, (5) moisture content, (6) pH, (7) absorbing powder, (8) compatibility, (9) adhesiveness, (10) specificity, (11) toxicity, (12) surface charge, (13) amount used, (14) mixing.

As with sprays, the particle size of dusts is of paramount importance. When efficiency was found to be inversely proportional to particle size, strenuous efforts were made to secure products of ultra-microscopic fineness. Later, it was observed with some materials, *e.g.*, pyrophyllite and rotenone, that ultra-fineness reduced toxicity; with others, such as silica, efficiency continued to increase with particle size reduction. Thus with dusts, as with wettable powders, a detailed study of particle size and toxicity is of real importance in arriving at the best formulation. Particle size and density influence deposition, distribution, and adherence of dusts, since groups of particles rather than individuals tend to settle on the treated plants. For this reason, as a general rule, large particles, up to 70μ give better coverage, more even distribution, and consequently better pest control than dusts of predominantly 2μ particles.

The end use to be made of the dust poses problems in its formulation since varying densities are

optimum for hand applicators, surface power dusters, and airplane applicators. Respectively these require light (30 to 35 lbs./cu. ft.), medium (35 to 45 lbs./cu. ft.) and heavy (50 to 60 lbs./cu. ft.) density material for maximum efficiency.

Control of the moisture content is also most important, not only from the standpoint of handling, but in terms of actual pest control as well. At least for insecticides, best control is effected with dusts of low moisture content; possibly this is due to the dessicating effect on the insect by the very dry dust.

Six factors contribute to the problem of compatibility of dusts: (1) excessive moisture, (2) excessive acidity or alkalinity, (3) excessive impurities (colloidal metals in the diluent), (4) excessive absorbing power reducing toxicity, (5) excessively fine particle size, (6) excessive abrasivesness.

Finished Formulations

AT least ten major problems must be overcome before a formulation may be considered acceptable:

(1) The product must handle easily. It must wet and disperse readily and without excessive foaming. It must be adaptable to many kinds of application equipment in wide dilution ratios from IX to 16X. Further, this equipment will vary greatly in its efficiency and the formulation must be able to be used in the least efficient.

(2) It must have at least a two year storage life during which it will remain essentially unaffected by temperature and humidity.

(3) It must not present undue hazards to the formulator or applicator and residues must not be deleterious nor harmful.

(4) It must be acceptable to the consumer from the standpoints of color and odor.

(5) It must not reduce the effectiveness of the toxicant.

(6) It must not injure nor make the crop plant unsightly.

(7) It must not be abrasive nor corrosive to application machinery and its component wood, metal or rubber parts. It must not degrease the machinery and preferably should not render the equipment unfit for other uses.

(8) It must be compatible with a host of other chemicals with which it will be used. "Combined washes" are almost universally used to control diseases, insects, correct nutritional deficiencies, even control weeds, and incompatibilities may severely limit the usefulness of a formulation of a new material.

(9) It must be produced at a cost which makes it profitable for the manufacturer, formulator, and distributor to sell and the consumer to use.

(10) It must satisfy the requirements of consumers of widely varying opinions among whom there is no agreement as to what constitutes a good formulation.

These, then, are the problems. They are not insoluble, but their complexity indicates that a logical, coordinated research program is necessary if a good formulation is to be developed. A thoroughly integrated team of formulation experts is as necessary to the successful development of new materials as is the team of research chemists who synthesize these new molecules and the biologists who discover their uses. This has been fully realized by the major chemical companies interested in developing new and useful agricultural chemicals.★★

LITERATURE CITED

(1) Burchfield, H. P. and George L. McNew. Mechanism of particle size effects of fungicides on plant protection. *Contrib. Boyce Thompson Inst.* 16: 131-161. 1950.

(2) Feichtmeier, Edmund F. The effect of particle size and solubility of sulfur in carbon disulfide upon its toxicity to fungi. *Phytopath.* 39: 605-615. 1949.

(3) Griffin, W. C. Emulsions. Encyclopedia of Chemical Technology. Raymond E. Kirk and Donald F. Othner, Eds. *Interscience Encyclopedia Inc.* 5: 692-718. 1950.

(4) Hamilton, J. M., D. H. Palmiter, and G. L. Mack. Particle size of sulfur and copper fungicides in relation to apple scab and cedar-apple rust control. *Phytopath* 33: 533-550. 1943.

(5) Harry, John B. Laboratory and field comparisons of tenacity agents for agricultural spray fungicides. Univ. of Pennsylvania PhD. Thesis, Philadelphia, Pennsylvania, 158 pp., Feb. 1948.

(6) Heuberger, John W. and James G. Horsfall. Relation of particle size and color to fungicidal and protective value of cuprous oxide. *Phytopath* 29: 303-321. 1939.

(7) McCutcheon, John W. Synthetic detergents . . . . up to date, II. *Soap and Sanitary Chemicals* 28: (7) 48-57, (8) 52-63, (9) 52-61, (10) 50-61. 1952.

(8) McNew, George L., and H. P. Burchfield. Particle size in relation to the fungitoxicity of dichloronaphthoquinone. *Contrib. Boyce Thompson Inst.* 16: 163-176. 1950.

(9) Miller, Roy E. Agricultural diluents. *Agricultural Chemicals* 5: (11) 43-47, 78, 79, (12) 45-48, 93-95. 1950.

(10) Schweyer, Herbert E. and Lincoln T. Work. Methods for determining particle size distribution. Symposium on new methods for particle size determination in the subsieve range. American Society for Testing Materials. Washington Spring Meeting, March 4. 1-22. 1941.

(11) Smith, Julian C. Mixers for pastes and powders. *Chemical Industries.* 66: 843-850, 921, 945. 1950.

(12) Watkins, Thomas C. and L. B. Norton. Properties and commercial sources of insecticide dust diluents and carriers. Agricultural Insecticide and Fungicide Assoc., New York, N.Y. 259 pp. mimeo. 1947.

(13) Wilcoxon, Frank and S. E. A. McCallan. The fungicidal action of sulfur III. Physical factors affecting the efficiency of dusts. *Contrib Boyce Thompson Inst.* 3: 509-528. 1931.

Author Harry lists ten problems to be solved before formulation is acceptable. In the end it must satisfy consumer requirements, a factor with no known criteria of quality standards

A New Business Develops...

Anhydrous Ammonia Application

ONE of the revolutionary trends in scientific farming over the past ten years has been the influx of anhydrous ammonia as a source of nitrogen for the soil. Although attempts to use this material as a nitrogen source for the soil date back many years, results were generally unsuccessful until recently, because of inadequate applicating equipment. It was not until 1947 that practical equipment for applying liquid ammonia to crops was developed by Dr. W. B. Andrews, Mississippi State College, thus providing agriculture with a new source for nitrogen.

As fertilizer manufacturers well know, cultivation of the soil for the past 200 years has starved much of our land of elements necessary to plant life. Faced by the need for tremendous tonnages of nitrogen annually to build back depleted soils, the problem of furnishing this needed nitrogen to our crops has been complicated over recent years, by a shortage of the product, high cost, and lack of knowledge by farmers as to the need of nitrogen in the soil. The lack of agricultural nitrogen was accentuated during the war years, due to tremendous government demand for nitrates for munitions manufacture. Recent developments making the use of anhydrous ammonia practical, have now fortunately provided a huge new supply of nitrogen for agricultural use.

The introduction of anhydrous ammonia as a nitrogenous fertilizer has provided agriculture with a low cost product, available in large supply. It has introduced also, however, a number of new problems . . . such as the need for standardized applicating equipment, insurance problems, working hazards, handling, storage and applicating problems.

Ammonia Properties

ANHYDROUS ammonia or "agricultural ammonia" is similar in some respects to liquefied petroleum gas (sometimes known as "bottled gas"), which is a hydrocarbon derived from natural gas or the refining of petroleum. Both anhydrous ammonia and LP-gas (abbreviation for liquefied petroleum) are liquids under pressure and can be handled as such in pressure cylinders. When released to the air, each becomes a gas again. Because of some properties similar to those of LP-Gas, which is an old and well known commercial product, a number of problems encountered in handling anhydrous ammonia are like those found in handling other pressure gases, and thus may be countered by similar means.

Ammonia is manufactured by the Haber process, in which a heated mixture of nitrogen and hydrogen

In The Photos

Top (right) How anhydrous ammonia is fed into soil by Suburban Farm Service Co. application units. (In actual practice, applicating knives are below ground level to prevent vapor escape.)

Middle picture: Typical unit for applying ammonia to pasture land. Material is applied to soil at depth of four to six inches.

Lower photo: Ammonia is delivered to farms in company-owned tanks like the 1,000-gallon model here. Sometimes tanks are left at farms and refilled regularly.

Bottom, page 46: General view of company's storage facilities.

under pressure is passed over a catalyst. In one form, or another, it is used in the manufacture of explosives, refrigerants, dyes, textiles, household ammonia and fertilizers. Agricultural ammonia as we know it today, is commercially pure and distinct from the aqueous solutions which are used as household cleaners. Under moderate pressure and at ordinary temperatures, it is a clear and colorless liquid.

New Type of Business

THIS new nitrogen source has introduced a number of new faces into the list of commercial firms supplying agricultural raw materials, supplies and equipment. Typical of such new companies is the Suburban Farm Service Co. Whippany, N. J., which is an eastern distributor of anhydrous ammonia. In the course of its commercial dealings, this company has had varied experiences in handling anhydrous ammonia, and some of these are reviewed in the following

summary of its general scheme of operations.

Organized in 1950, the Suburban Farm Service Co. is a wholly owned subsidiary of the Suburban Propane Gas Corporation of Whippany, N. J. — largest independent marketer of liquefied petroleum gas in the United States. This parent company supplies farmers with LP-Gas for their domestic needs. Anhydrous ammonia provided the answer to the company's quest for diversification, yet, as indicated above, it is similar enough to LP-Gas to require like techniques for shipping, storing and distribution. In 1950, Dr. Andrews of Mississippi State — the recognized leader in the pioneering of anhydrous ammonia application — was retained by the Suburban Farm Service Co. in an advisory capacity.

Supplies of ammonia are purchased in carload lots from eastern producers, and are "packaged" in tanks at the company's bulk plants at Berlin, N. J., Delmar, Md., Keller, Va., Orangeburg, S. C., Roduco, N. C. and Wilson, N. C.

Suburban Farm Service Co. sells agricultural ammonia to small and large independent farmers as well as farming companies. The majority of sales in the eastern U. S. today are to growers of such crops as corn, small grains, potatoes, tomatoes, etc.

The fertilizer is ordinarily delivered to the farm in company owned tanks, usually of 500 gallon capacity. In the case of very large users, the tanks are sometimes left on the farm and refilled periodically by tank truck delivery. If a farmer lives close enough to one of the company's bulk plants, he may, using the company's tanks, come to the plant and pick up his supply of agricultural ammonia, carting it back to his farm himself. Credit is then given to the farmer for his self service.

If the farmer prefers to apply agricultural ammonia himself (the more economical procedure in the long run) he may buy the necessary equipment. Suburban Farm Service Co. maintains experienced personnel to orient the new user on this modern method of fertilization and to show him how to apply agricultural ammonia to its best advantage. A field representative actually applies the fertilizer to the farmer's crops in most instances of first usage.

AGRICULTURAL ammonia is applied directly to the soil at a depth of four to six inches by means of a simple applicating unit. This consists of a tank connected to small metal tubes attached to the trailing edges of sabre-shaped blades or applicators. The amount of ammonia applied per acre is regulated either by a positive displacement meter pump or by a liquid regulator. After passing through the regulating device, the ammonia goes through an opening at any desired depth and the pump, driven from the ground wheel or the regulator, is set to apply the ammonia at the desired rate.

Generally, tractor mounted applicators are used for row crops and a trailer unit is used for applying agricultural ammonia to small grains and pastures such as a pre-plant or side or top-dressing.

How does agricultural ammonia compare with other nitrogenous fertilizers? A look at the following table, prepared by the Suburban Farm Service Co., shows agricultural ammonia to contain more than twice as much nitrogen per ton as the next highest source of commercial fertilizer:

One Ton of:	*Contains No. Lbs. Nitrogen*
Anhydrous Ammonia	1,640
Ammonium Nitrate	650
Cyanamid	440
Sulfate of Ammonia	410
Nitrate of Soda	320
5-10-5	100
Fresh Manure	10

The fundamental fact to consider in any appraisal of anhydrous ammonia is its high nitrogen content, a higher percentage of nitrogen — in a form useful to plant life — than any other source of nitrogen. Used directly as a fertilizer, it has the following economic advantages:

(a) Low shipping and handling costs per pound of nitrogen.

(b) Low labor cost per pound of nitrogen, since few manufacturing steps are required to produce anhydrous ammonia. Practically all other chemical nitrogenous fertilizers are made by mixing or reacting other chemicals with ammonia, thus requiring additional labor as well as some loss of nitrogen in processsing.

In addition to these fundamental economic advantages, which in the long run should result in lower fertilizer costs per pound of nitrogen for the farmer, anhydrous ammonia embodies several other advantages:

(a) Nitrogen, in the ammonium form, immediately attaches itself to clay particles in the soil as the ammonia is applied. In this form it is not subject to leaching. Three to six weeks are required for the ammonium form to change to the nitrate form — when leaching can occur.

(b) Most plants use nitrogen in the form of anhydrous ammonia just as readily as they use nitrogen in the nitrate form.

(c) Since anhydrous ammonia is injected below the surface of the soil, it is readily available for plant use — independent of a favorable rainfall to drive it down into the soil. While in the ammonium form and protected from the elements, even a downpour cannot wash it away.

(d) Less labor is required to apply ammonia than to apply other fertilizers.

As is the case with many fertilizers on the market today, and especially with those of more recent origin, available information on agricultural ammonia is not complete. Important, but unknown, factors such as "how to apply" and "when", remain to be

(*Turn to Page* 125)

Program for New Orleans Meeting nears completion by

National Agricultural Chemicals Ass'n

EXPECTED to be one of the largest spring conventions in its history, the National Agricultural Chemicals Association will hold its annual meeting at the Jung Hotel, New Orleans, La., March 11-13.

According to the advance program issued by the NAC late in January, registration will begin on Tuesday afternoon, March 10, with the meeting proper being called to order at 10 o'clock March 11. Paul Mayfield, Hercules Powder Co., Wilmington, Del., NAC vice-president, will preside at this opening session.

Arthur W. Mohr, president, California Spray Chemical Corp., Richmond, California, Association president, will present his address as a feature of the morning's program. Lea S. Hitchner, Washington, D. C., executive secretary-treasurer of the NAC Association, will follow Mr. Mohr with a report to the group.

Avery S. Hoyt, chief of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C., will talk on "Some Important Economic Pest Problems" and Dr. A. F. Camp, vice-director in charge of Florida Experiment Station, Lake Alfred, Fla., will discuss "Minor Elements and Nutritional Sprays."

"Transportation Dollars and Sense" is the topic slated for discussion by E. C. McClintic, vice-president, traffic, of the Pure Carbonic Co., New York, an authority on the subject of transporting chemicals.

"Recent Advances in Weed Control" is the subject chosen by Dr. Warren C. Shaw, agronomist in the Division of Weed Investigations, Bureau of Plant Industry, Soils and Agricultural Engineering, U.S.D.A., Beltsville, Md.

Appearing as final speaker on the morning's program, will be Hon. Allen J. Ellender, U. S. Senator from Louisiana.

A reception is planned for 6:30 P.M., Wednesday.

Thursday's program will consist of various committee meetings, a session of the NAC board of directors and the annual golf tournament, details of which will be announced at New Orleans.

(*Turn to Page* 113)

AVERY S. HOYT
Chief, Bureau of Entomology and Plant Quarantine to speak

Hon. ALLEN J. ELLENDER
Louisiana senator final speaker Wednesday morning's program

PAUL MAYFIELD
NAC vice-president scheduled to preside at opening session

Now adopted for labeling under US Act of 1947, are common names of these complex organic

Insecticides & Fungicides

DURING the past few years much research has been conducted in connection with the development of insecticides and fungicides, and many new organic chemicals have been prepared and tested and found to be highly effective for these uses. A number of these compounds are of complex chemical structure and their chemical names are meaningless to the layman.

In order to simplify this problem, and for the sake of uniformity, the Committee on Insecticide Terminology of the American Association of Economic Entomologists has compiled a list of names and symbols(1) for use in the *Journal of Economic Entomology* and in manuscripts and releases from the Bureau. These names may also be used on labels of products subject to the Federal Insecticide, Fungicide and Rodenticide Act.

The terms designated by two asterisks are approved common names and those designated by one asterisk are trade names. Others are interim designations that may be used until approved names have been established.

In this list, the adopted common name or symbol is followed by the chemical name of the compound, and under the words "ACTIVE INGREDIENT" is the name accepted by the Insecticide Division of the Department of Agriculture for use in the ingredient statement on the label to comply with the Federal Act. Other designations for these compounds that have been used in the trade, are indicated in parentheses following the chemical name.

INSECTICIDES

ALDRIN** . . . not less than 95 per cent of 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-dimethano-naphthalene. (Compound 118.)

Active Ingredients

Hexachloro-hexahydro-dimethano-naphthalene ——%
Related compounds ——%

ALLETHRIN** . . . dl-2-ally-4-hydroxy-3-methyl-2-cyclopenten-1-one esterified with a mixture of cis and trans dl-chrysanthemum monocarboxylic acids. (Allyl homolog of Cinerin 1. Synthetic pyrethrins.)

Active Ingredient

Allyl homolog of Cinerin 1. (Allethrin) ——%

ARAMITE* . . . product containing 2-(*p*-*tert*-butyl-phenoxy)-1-methylethyl 2-chloroethyl sulfite. (88R. Alkyl aryl sulfite.)

Active Ingredient

2-(*p*-*tert*-butylphenoxy)isopropyl 2-chloroethyl sulfite ——%

BHC . . . 1,2,3,4,5,6-hexachlorocyclohexane, consisting of several isomers and containing 12 to 14 per cent of the gamma isomer. (Benzene hexachloride. Gammexane*. 666).

Active Ingredients

Gamma isomer of Benzene Hexachloride ——%
Other isomers of Benzene Hexachloride ——%

CHLORDANE** . . . 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene. (Velsicol 1068*. Octachlor*. Octa-Klor*).

Active Ingredient

Technical Chlordane* ——%

*Equivalent to —% of octachloro-4,7-methano-tetrahydro-indane, and —% of related compounds.

BIS(*p*-chlorophenoxy)methane. [Di(4-chlorophenoxy)methane. K-1875. Neotran*].

Active Ingredient

Bis(*p*-chlorophenoxy)methane —%

p-CHLOROPHENYL *p*-CHLOROBENZENESULFONATE. (K-6451. Ovotran*).

Active Ingredient

p-chlorophenyl *p*-chlorobenzenesulfonate ——%

COMPOUND 923 . . . 2,4-dichlorophenyl ester of benzenesulfonic acid. (Genitol 923).

Active Ingredient

Dichlorophenyl Benzenesulfonate ——%

COMPOUND 22008 . . . 3-

(1) Haller, H. L., Bureau of Entomology & Plant Quarantine release January 10, 1952. Rohwer, S. A., Bureau of Entomology and Plant Quarantine release October 3, 1949. U. S. D. A. Yearbook, 1952, pg. 748. Interdepartmental Committee on Pest Control release, September 25, 1952.

List Compiled by

Dr. C.C. McDonnell

methyl-1-phenyl-5-pyrazolyl dimethylcarbamate. (G-22008).

Active Ingredient

3-Methyl-1-phenyl-5-pyrazolyldimethylcarbamate ——% (?)

CS-645* . . . 1,1-bis (*p*-chlorophenyl)-2-nitropropane. (Prolan*).

Active Ingredient

Bis(*p*-chlorophenyl)nitropropane ——%

CS-674A* . . . 1,1-bis (*p*-chlorophenyl)-2-nitrobutane. (Bulan*).

Active Ingredient

Bis(*p*-chlorophenyl)nitrobutane ——%

CS-708* . . . mixture of 1 part 1,1-bis(*p*-chlorophenyl)-2-nitropropane (CS-645A) and 2 parts 1,1-bis (*p*-chlorophenyl)-2-nitrobutane (CS-674A). (Dilan*).

Active Ingredients

Bis(*p*-chlorophenyl)nitropropane ——%

Bis(*p*-chlorophenyl)nitrobutane ——%

D-D MIXTURE . . . mixture of 1,2-dichloropropane and 1,3-dichloropropene. (D-D*).

Active Ingredients

1,2-Dichloropropane ——%

1,3-Dichloropropene ——%

DDT . . . commercially available dichloro-diphenyl-trichloroethane, the principal constituent of which is 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane. (Chlorophenothane. U. S. Pharmacopoeia 14:136:1950).

Active Ingredient

Dichloro-diphenyl-trichloroethane (DDT) ——%

DFDT . . . 1,1,1-trichloro-2,2-bis(*p*-fluorophenyl)ethane. (Fluorine analog of DDT).

Active Ingredient

Difluoro-diphenyl-trichloroethane ——%

DIELDRIN** . . . not less than 85 per cent of 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene. (Compound 497).

Active Ingredient

Hexachloro-epoxy octahydro endo-endo dimethanonaphthalene ——%

DIISOPROPYL p-NITROPHENYL THIOPHOSPHATE . . . 0,0-diisopropyl 0-*p*-nitrophenyl thiophosphate. (Compound 3456).

Active Ingredient

0,0-diisopropyl-0-*p*-nitrophenyl thiophosphate . . . . . ——% (?)

DIMETHYL CARBATE . . . dimethyl ester of cis-bicyclo (2.2.1)-5-heptene-2,3-dicarboxylic acid.

Active Ingredient

Dimethyl Bicycloheptene-dicarboxylate . . . . . ——%

DMC . . . 4,4-dichloro-alpha-methylbenzhydrol. [Di(*p*-chlorophenyl) methylcarbinol. 1, 1-bis (*p*-chlorophenyl) ethanol. Dimite*].

Active Ingredient

1,1-Bis (*p*-chlorophenyl) ethanol ——%

E-1059 . . . 0-[2-(ethylmercapto) ethyl] 0,0-diethyl thiophosphate. (A trialkyl thiophosphate. See Systox).

Active Ingredient

0-[2-(ethylmercapto)ethyl]-0,0-diethyl thiophosphate . . . . ——%

EPN* . . . 0-ethyl 0-*p*-nitrophenyl benzenethiophosphonate.

Active Ingredient

Ethyl *p*-nitrophenyl thiono benzene-phosphonate . . . . . ——%

2-ETHYL-1,3-HEXANEDIOL. (Rutgers 612*).

Active Ingredient

Ethylhexanediol . . . . . ——%

ENDRIN**. . .1,2,3,4,10,10-hexachloro-6,7, epoxy-1-4,4a,5,6,7,8,8a-octahydro-1,4,5,8,-endo-endo-dimethanonaphthalene. (An isomer of Dieldrin).

Active Ingredient

Hexachloro epoxy octahydro endo-endo dimethano naphthalene ——% (?)

HEPTACHLOR** . . . 1(or 3a), 4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene. (Velsicol 104*. E-334).

Active Ingredient

Heptachlor (Heptachloro-tetrahydro-methanoindene) . . . ——%

HETP . . . mixture of ethyl polyphosphates containing 12 to 20 per cent of tetraethyl pyrophosphate. (Hexaethyl tetraphosphate).

Active Ingredient

Tetraethyl pyrophosphate. . ——%

Other ethyl phosphates . . ——%

INDALONE* . . . butyl ester of 3,4-dihydro-2,2-dimethyl-4-oxo-1,-2H-pyran-6-carboxylic acid. [n-butyl mesityl oxide oxalate. Butopyronoxyl, (U. S. Pharmacopoeia 14:91:1940].

Active Ingredient

Butyl dimethyl dihydro gamma pyrone ——%

LINDANE** . . . gamma isomer of benzene hexachloride of not less than 99 per cent purity,1,2,3,4,5,-6-hexachlorocyclohexane.

Active Ingredient

Gamma isomer of benzene hexachloride (from Lindane) . . . ——%

ISODRIN . . . 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo-endo-dimethanonaphthalene. (An isomer of ALDRIN).

Active Ingredient

(No name yet set up officially).

MALATHON** . . . 0,0-dimethyl dithiophosphate of diethyl

mercaptosuccinate. [Compound 40-49. S-(1,2-dicarbethoxyethyl)0,0-dimethyl dithiophosphate].

Active Ingredient

Malathon (0,0-dimethyl dithiophosphate of diethyl mercaptosuccinate) ——%

METACIDE* . . . product containing methyl parathion and parathion.

Active Ingredients

Parathion (0,0-diethyl 0-*p*-nitrophenyl thiophosphate. . .——%
0,0-dimethyl 0,*p*-nitrophenyl thiophosphate) . . . . . ——%

METHOXYCHLOR** . . . 1,1,1-trichloro-2,2-bis (*p*-methoxyphenyl) ethane. (Marlate*. DMDT).

Active Ingredient

Technical Methoxychlor*. .——%

*Equivalent to ——% 2,2-bis (*p*-methoxyphenyl) - 1,1,1 - trichloroethane, and ——% of related compounds.

(Technical Methoxychlor contains about 88% of the *p,p'*-isomer and 12% of related compounds).

METHYL PARATHION . . . 0,0-dimethyl 0,*p*-nitrophenyl thiophosphate. (Methyl homolog of parathion).

Active Ingredient

0,0-dimethyl 0,*p*-nitrophenyl thiophosphate . . . . . ——%

4 - METHYLUMBELLIFERONE 0,0-DIETHYL THIOPHOSPHATE. (0,0-diethyl thiophosphoric acid ester of 7-hydroxy-4-methylcoumarin. Potasan*. E-838).

Active Ingredient

(No name yet set up officially).

MGK-264* . . . N-(2-ethylhexyl)bicyclo(2.2.1)-5-heptene-2,3-dicarboximide. [N-octylbicyclo(2.2-1)-5-heptene-2,3-dicarboximide. Octacide 264*. Van Dyk 264*]

Active Ingredient

Octyl bicycloheptene dicarboximide ——%

PARA-OXON . . . diethyl *p*-nitrophenyl phosphate. (Oxygen analog of parathion. E-600).

Active Ingredient

Diethyl *p*-nitrophenyl phosphate ——% (?)

PARATHION** . . . 0,0-diethyl 0,*p*-nitrophenyl thiophosphate. (E-605. Compound 3422).

Active Ingredient

Parathion (0,0-diethyl 0,*p*-nitrophenyl thiophosphate) . .——%

PIPERONYL BUTOXIDE... product containing as its principal constituent alpha-[2-(-butoxyethoxy) methoxy]-4,5 - methylenedioxy - 2-propyl toluene. [(butyl carbityl) (6-propyl piperonyl) ether. Compound 312].

Active Ingredient

Technical piperonyl butoxide* ——%

*Equivalent to ——% of (butyl carbityl) (6-propyl piperonyl) ether, and——% of related compounds.

PIPERONYL CYCLONENE . . . mixture of 3-alkyl-6-carbethoxy-5(3,4 - methylenedioxyphenyl)-2-cyclohexen-1-one and 3-alkyl-5(3,4-methylenedioxyphenyl) -2-cyclohexen-1-one. (Piperonyl Cyclohexenone).

Active Ingredient

Technical piperonyl cyclonene* ——%

*Equivalent to——% of 3-isoamyl-5-(methylene dioxyphenyl) - 2-cyclohexanone and its 6-carbethoxy derivative, and——% of related compounds

Q-137 . . . 1,1-dichloro-2,2-bis (p-ethylphenyl)ethane.

Active Ingredient

Diphenyl diethyl dichloroethane ——% (?)

R-242 . . . 70 per cent of *p*-chlorophenyl phenyl sulfone plus 30 per cent of related sulfones. (Sulphenone*).

Active Ingredients

p-chlorophenyl phenyl sulfone——%
Related sulfones ——%

SCHRADAN . . .octamethyl pyrophosphoramide. [bis (bis - di methylamino)phosphorous anhydride. OMPA. Pestox III*].

Active Ingredient

Octamethyl pyrophosphoramide ——%

SULFOTEPP . . . tetraethyl dithiopyrophosphate. (Dithione*).

Tetraethyl dithiopyrophosphate ——%

SYSTOX* . . . product containing E-1059.

Active Ingredient

(Same as E-1059).

TDE . . . commercially available dichloro-diphenyl-dichloroethane, the principal constituent of which is 1,1-dichloro-2,2-bis (p-chlorophenyl)-ethane. (DDD. Rhothane*).

Active Ingredients

Dichloro-diphenyl-dichloroethane ——%

TEPP. . . tetraethyl pyrophosphate. (TEP).

Active Ingredient

Tetraethyl pyrophosphate. .——%

TOXAPHENE** . . .chlorinated camphene having a chlorine content of 67-69 per cent. (Compound 3956).

Active Ingredient

Toxaphene (Technical chlorinated camphene, chlorine content 67-69%) ——%

FUNGICIDES

CHLORANIL** . . . 2,3,5,6-tetrachloro-1,4-benzoquinone. (Tetrachloro-*p*-benzoquinone. Tetrachloroquinone. Spergon*).

Active Ingredient

Chloranil (Tetrachloro-parabenzoquinone) ——%

CAPTAN**. . . N-trichloromethylmercapto -4-cyclohexene -1,2-dicarboximide. (N - trichloromethylthio tetrahydrophthalimide).

Active Ingredient

Captan (N-trichloromethylmercapto-4-cyclohexene-1,2-dicarboximide) ——%

FERBAM** . . . ferric dimethyl dithiocarbamate. (Fermate*. Karbam*).

Active Ingredient

Ferbam (Ferric dimethyl dithiocarbamate) ——%

(*Turn to Page 123*)

Insecticide Residue Reduction in Food Processing

By Richard Nyquist & V. G. Heller

Oklahoma Agricultural Experiment Station
Stillwater, Okla.

INTRODUCTION of the chlorinated hydrocarbon DDT a few years ago gave the entomologist a new weapon for the control of destructive insects. Its use, however, has created many new problems for the chemist and the nutritionist. It was soon found that DDT and other pesticides were toxic for man and animal as well as for insects, and insecticidal residues on plants or food might render these nutrients unfit for consumption. The Oklahoma experiment station laboratory reported that DDT was excreted in the milk and deposited in the fat of cattle that had ingested or had been sprayed with this insecticide. Because of this, the Food and Drug Administration soon forbade its use on cattle and in creameries.

Land that had been repeatedly sprayed was also found to carry a deposit of the chemical. However, it has been reported by many laboratories that the amount of DDT spray residue is affected by light, oxygen of the air, time, temperature, and rainfall. As each of the new chlorinated hydrocarbons was introduced as an insecticide, and later the phosphorus compounds, similar investigations became necessary for each.

The particular work reported here is the effect of processing on residues by washing, open kettle cooking, pressure cooking, and freezing of vegetables previously sprayed with lindane and parathion emulsions.

The processing in our experiment station at Oklahoma A. and M. has been done on a variety of vegetables, but the reduction of the residue by the different processes seems to follow a trend; consequently, the experimental data on spinach and beans only will be offered as representative.

Lindane and parathion residues were extracted from the vegetables with benzene by tumbling in glass sealed jars for 30 minutes. All of the colored pigments were removed, leaving a clear solution of benzene containing the dissolved insecticide. The evaporation of the benzene was hastened by infra-red lights, and an electric fan.

Lindane, the gamma insomer of benzene hexachloride with the 1,3 chloride molecules on one side of the ring and the 2,4,5,5 chloride molecules on the other side, was analyzed by the total chloride method developed by Carter.

The parathion, 0,0-diethyl O,p-nitrophenylthiophosphate, was analyzed by a colorimetric method developed by Averell and Norris.

All of the vegetables were washed three times except the ones that were frozen. The vegetables were cooked in an open-kettle for one-half hour, pressure cooked at 15 lbs./sq. inch at 120° C for 15 minutes, and frozen solidly in a deep freeze storage refrigerator.

Blanks were run on each vegetable to insure that all of the chloride found, or the color that developed, was due to the residue.

The data suggest certain conclusions. Although lindane and parathion residues decrease in the amount present on the vegetables a few days after the application of the insecticide, this is rather deceiving because the increased weight of the plant due to growth accounts for approximately 70% of the apparent loss in one week. The remainder of the loss is due to evaporation, oxidation, or hydrolysis. This reduction is aided by light, time, temperature, rain fall, and oxygen of the air.

In processing, the reduction of the insecticidal residue is actual, but not apparent because there is no outside factor involving the increased weight of the plant.

The greater the amount of insecticidal residue present upon the vegetables, the greater the percentage of the residue removed by processing. As the deposit of the residue decreases, it becomes harder to remove. This is probably due to an adherence to the plant of those organic molecules which are in direct contact with it.

Reduction of residue by washing is very effective, since more is lost from the higher concentrations of the residue than at the lower concentration . . . a 50-75% reduction.

Washing and open-kettle cooking had the greatest effect on the removal of the residue in nearly all of the analyses. This is probably due to the greater chance for evaporation and oxidation of the insecticide.

Washing and pressure cooking were very effective, but not as effective as open-kettle cooking.

It was thought that by freezing the vegetables, there would be no reduction in the amount of the insecticidal residue, but surprisingly, a reduction was found upon analysis. This reduction, it is believed, is due to hydrolysis of both parathion and lindane when they come in contact with the vegetable water and the dissolved contents in the water upon thawing of the vegetables.

The toxicity of these insecticides is such that we cannot dismiss the possible dangers of indiscriminate use. However, our work would indicate that under proper spray conditions, harvesting and processing of such foods, there would be very small probability of the existence of any dangerous quantities of spray residues.★★

Niagara Division Expands Technical Staff

NIAGARA Chemical Division of Food Machinery and Chemical Corp., in conjunction with an overall expansion program of the Department of Research and Development, has announced the recent addition of several research specialists to its present staff at Middleport, New York.

DR. CURTIS L. MASON

DR. EDWARD S. HAGOOD

Dr. Curtis L. Mason, plant pathologist, formerly with the University of Arkansas, is now a member of the Niagara staff, bringing to the department a broad knowledge of fruit-disease problems in addition to first-hand experience with the cotton disease situation. Dr. Mason, a native of East Texas, received degrees of Bachelor of Science and Master of Science at Texas A. and M. He later took work at the University of Wisconsin and obtained his Ph.D from the University of Illinois. Dr. Mason will be closely associated with Niagara's field service to agriculture.

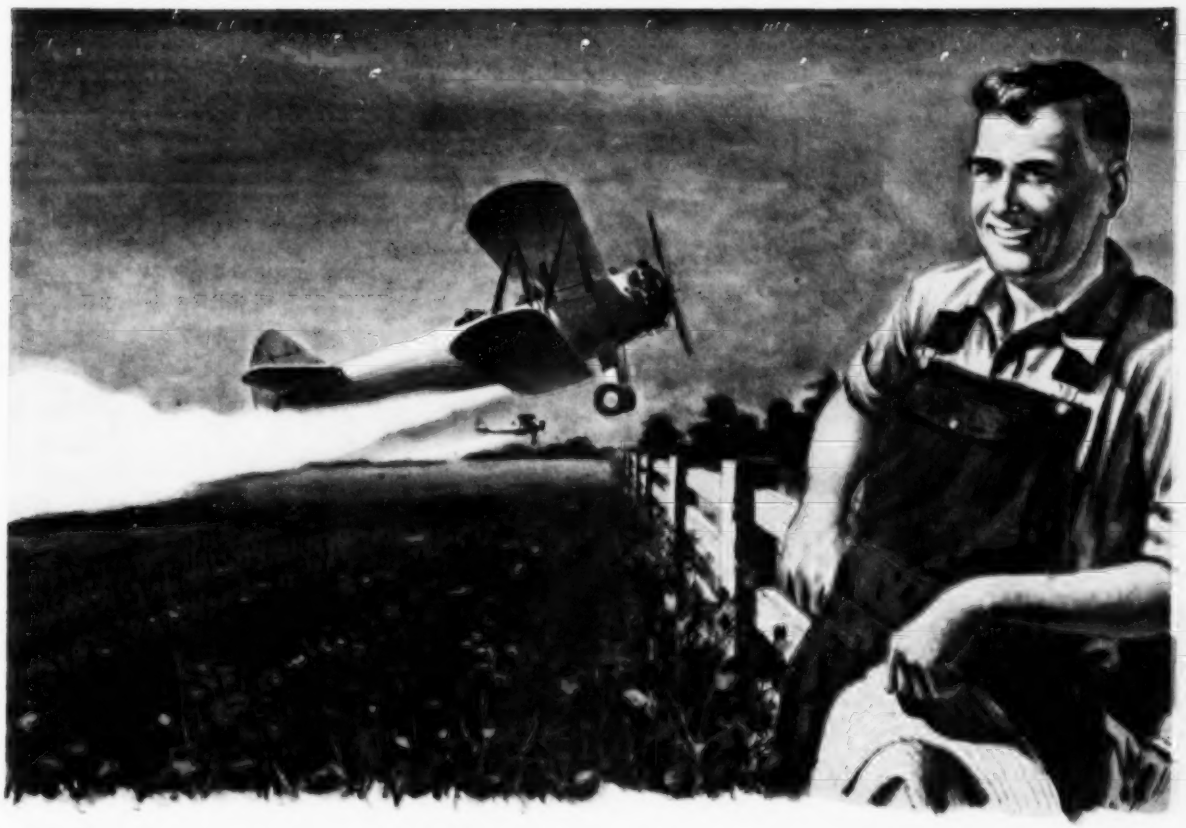
Dr. Edward S. Hagood, herbicide specialist, was formerly associated with the University of Georgia where he worked with the Divison of Weed Investigation, U.S.D.A. in cooperation with the University of Georgia. He is now a member of the Niagara research department. Dr. Hagood will be handling herbicide problems in the department while cooperating with state and federal authorities in further testing and developing materials and methods in his special line. Dr. Hagood received his formal education at Louisiana State U. and the University of Georgia.

Dr. Norman Krog, who received his B.S. in Agricultural Bio-Chemistry and his Ph.D in Agricultural Botany at the University of Minnesota, is now located in the Niagara Middleport laboratory, working in the development and screening of herbicides.

Russell M. Wilhelm, Jr., who studied at Ohio State and received his graduate work at Cornell University, is now with Niagara handling various projects in connection with the overall research program.

At Niagara's West Coast branch, Richmond, California, a new addition to the staff is O. H. Fulmer, who did graduate work in entomology at the University of California. Dr. Fulmer, with the regular research staff at Richmond, has recently moved into new research buildings housing the offices and labs. of the department.

In the expansion of Niagara's research and development department, new and larger operating facilities have been enlarged in keeping with additions to the staff. Presently under construction are new administrative offices and a new formulations laboratory, the company reports.



What happens when a cotton field is hit with BHC dust?

Two very important things happen. The murderous marauder of the cotton field . . . the boll weevil . . . is destroyed. And the cotton grower realizes such great increases in his cotton yield that it is nothing short of amazing.

What is BHC? This is an abbreviation for Benzene Hexachloride, an important product of Columbia-Southern Chemical Corporation. BHC is in the form of white flakes and is used extensively in the manufacture of insecticides.

How is it used? One 55 ton tank car of Columbia-Southern liquid chlorine can be processed into 3 carloads of BHC. This BHC is then mixed with other ingredients to make 15 carloads of cotton dust. This dust is sufficient to treat 12,800 acres of cotton plants, or 20 square miles, against the ravages of the boll weevil.

What is the result? Ordinarily, 20 square miles of untreated cotton, heavily infested with insects, will produce about 8 million pounds of seed cotton. When treated with BHC cotton dust, and other good production practices are followed, yields up to 14 million pounds of seed cotton have been obtained . . . a gain of about 6 million pounds!

What can 6 million pounds make? This gain in yield alone represents an extra 3,700,000 pounds of cotton seed per 20 square miles which will make 14 carloads of oleomargarine, plus 7 carloads of linters for gunpowder, plus enough feed to produce 7 carloads of beef. And on top of all this, there is an extra 2,300,000 pounds of lint cotton which will make 1,035,000 double bedsheets . . . equivalent to 21 carloads!

That, briefly, is part of the story of BHC dust and its vast contribution to the art of efficiently growing cotton.

BHC is one of the many chemical specialties of Columbia-Southern, a leading producer of chlorine and alkalies.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

EXECUTIVE OFFICES: FIFTH AVENUE AT BELLEFIELD, PITTSBURGH 13, PA.
DISTRICT OFFICES: BOSTON • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • HOUSTON • MINNEAPOLIS • NEW ORLEANS • NEW YORK • PHILADELPHIA • PITTSBURGH • ST. LOUIS • SAN FRANCISCO

SODA ASH • CAUSTIC SODA • LIQUID CHLORINE • SODIUM BICARBONATE • CALCIUM CHLORIDE • MODIFIED SODAS • CAUSTIC POTASH • CHLORINATED BENZENES • MURIATIC ACID • PERCHLORETHYLENE • SILENE EF • HI-SIL • CALCENE TM • CALCENE NC • PITTCHLOR (Calcium Hypochlorite)

People *will talk*

開密克幫我們發展工業。
"Chemico helped us develop our industry"

"Chemico" heeft ons meer gegeven dan wij verwachtten.
"Chemico gave us more than we expected"

"كيميكو" تبنّه
"It's designed by Chemico"

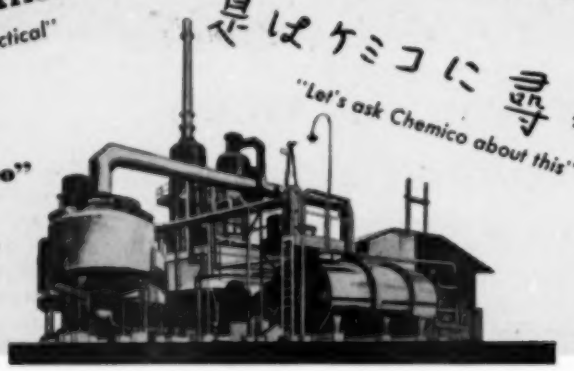
"केमिको" ने सारा काम किया।
"Chemico did the whole job"

"Chemico" comprend nos problèmes.
"Chemico understands our problems"

"CHEMICO" SABE SE É PRÁTICO.
"Chemico knows whether it's practical"

ケミコに尋ねよう!
"Let's ask Chemico about this"

La reputación de "Chemico" nos ha persuadido.
"Chemico's reputation sold us"



When our representatives travel to the far corners of the earth, they find that word of Chemico's activities has gone before them.

Yes, people *will* talk . . . and carry the news of Chemico accomplishments in the design and construction of plants for the production of heavy chemicals: fertilizers for India, Mexico, the Philippine Islands and Egypt; sulfuric acid for Canada, England, Formosa and Brazil; urea for Japan; sulfur recovery for Colombia; pickle liquor recovery for the Union of South Africa, to name a few. And naturally these are in addition to numerous large-scale projects in the United States.

Chemico has created, designed and erected more than 800 installations during the past 37 years that have given people much to talk about. That's why "Discuss it with Chemico" has become a byword of those who need new facilities or additional plant capacity to meet the world's ever-expanding heavy chemical needs.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

CABLES: CHEMICONST, NEW YORK

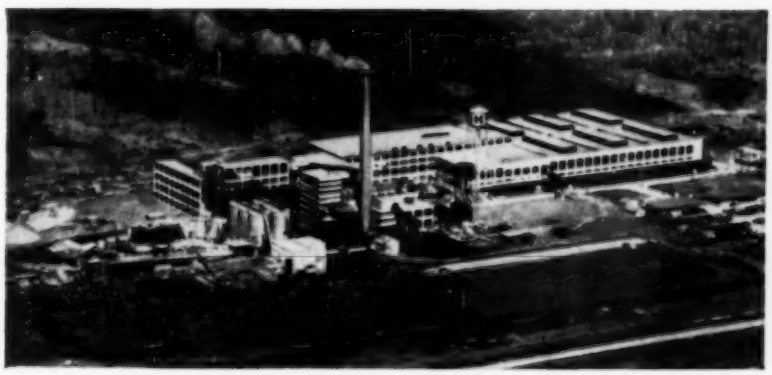
TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICA CYANAMID (PTY) LTD., JOHANNESBURG

CHEMICO

Chemico plants are profitable investments

CC-556

HUDSON MULTIWALL SACKS ARE NOW THE INDUSTRY'S MOST FULLY GUARANTEED



This huge new ultra-modern Hudson mill at Palatka, Florida can make firm promises because it is independent of outside suppliers who may cause delays. Here, every step in the manufacture of Hudson Multiwall Sacks, from tree to the finished product, is under Hudson's exclusive ownership.

INTEGRATED OPERATION BACKS UP HUDSON GUARANTEE

PALATKA, FLA. Hudson is the only Multiwall Sack manufacturer to guarantee its sacks against breakage on the filling or closing machines. The company has enough faith in its product to agree to replace without cost all Hudson Multiwall Sacks that fail on the purchaser's packing or closing machines.

Hudson's fully integrated operation provides the control of quality that such an unusual guarantee demands. Variations from outside suppliers are eliminated. To assure a dependable source of pulp Hudson owns and maintains 435,000 acres of choice timber. The strong, long-fibered Kraft is manufactured with laboratory controlled uniformity. The finished sacks (pasted, sewn, valve, or open mouth) are tailored to your most exacting specifications. And assured delivery is available by rail, truck, or water.

HOW HUDSON'S NEW GUARANTEE WORKS

When Hudson Multiwall Sacks are delivered into your custody, the company's new guarantee goes into full force.

All Hudson Multiwall Sacks must successfully pass your packing machines or be replaced without cost.

All Hudson Multiwall Sacks must pass your closing operations without failure, or Hudson will replace them.

Replaces Multiwall Sacks broken on your packer

NEW YORK CITY. "Our new guarantee to replace without cost every sack broken in packing and closing on your machines," stated T. H. Mittendorf, Hudson's Vice-President in Charge of Sales, "makes our Multiwall Sacks the most fully guaranteed in the industry. This is a big advantage to buyers because now they can count on using every sack they purchase."

T. H. Mittendorf

Mr. Mittendorf further explained, "Until Hudson introduced this new replacement policy, every user had to pay for his own losses for normal breakage on the packing or closing machines. But Hudson's new guarantee has changed all that. Now, when you use Hudson Multiwall Sacks, your original cost for sacks is your final cost!"

Urge Multiwall Sack users to write for facts

The Hudson Pulp & Paper Corp. invites all users of Multiwall Sacks to learn how they can benefit using guaranteed Hudson Sacks. Examine ... see this ... and ... are promised!

Send for full details!

Tell me, without obligation, about the many advantages of your new Multiwall guarantee.

NAME

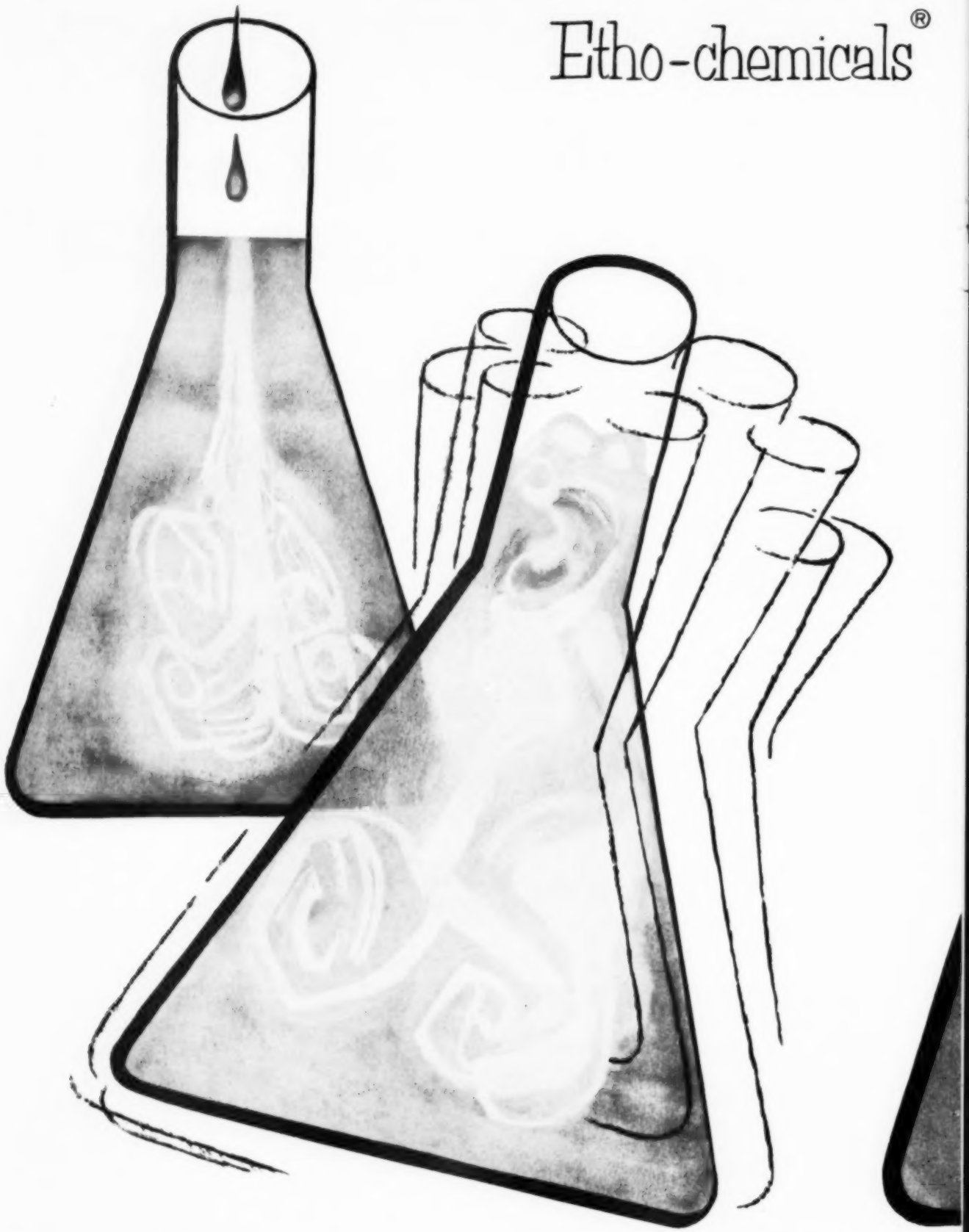
COMPANY

STREET ZONE STATE

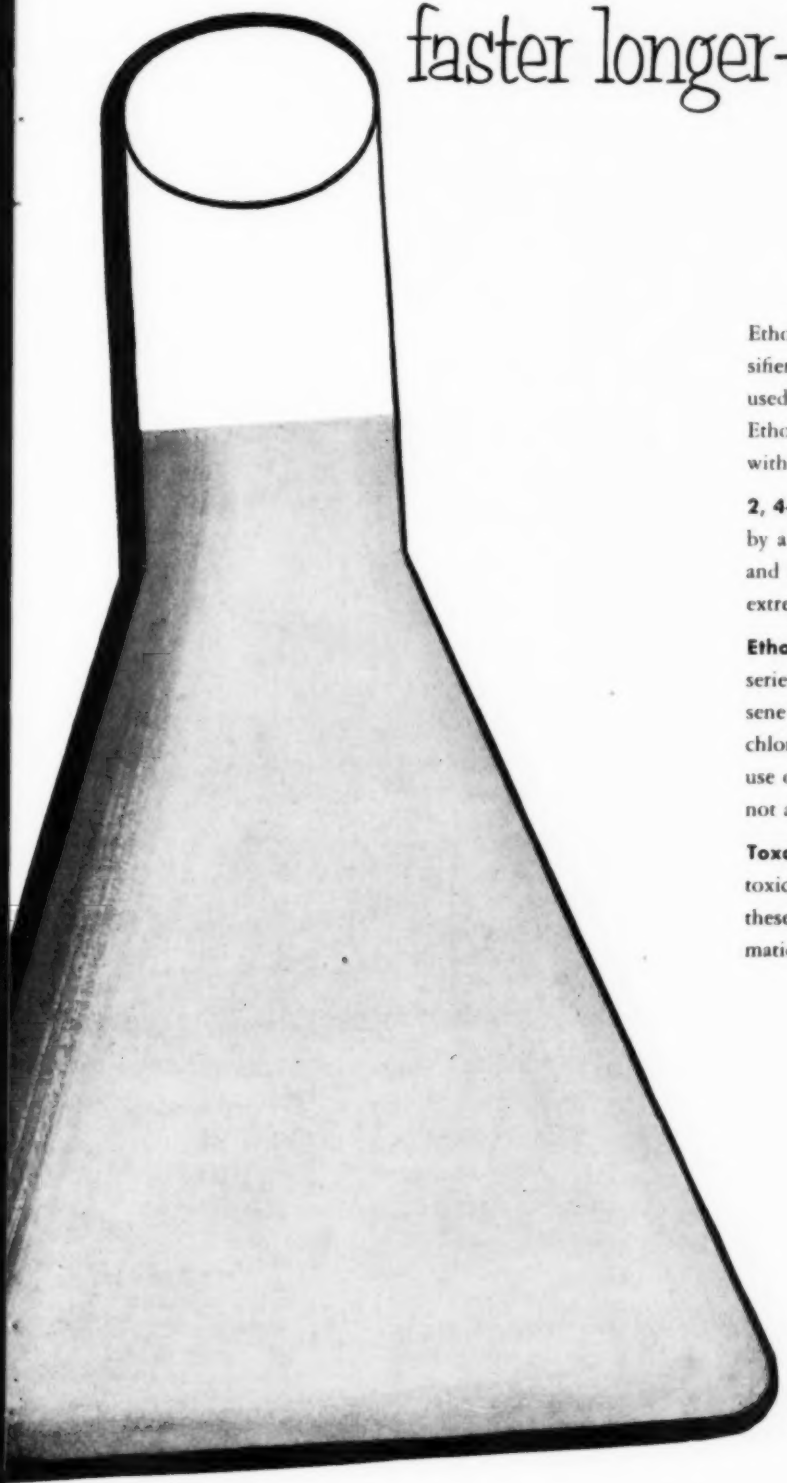
CITY

Hudson Pulp & Paper Corp.
Dept. 143 505 Park Ave., New York 22, N.Y.

Etho-chemicals®



and *Minimum Agitation* give you faster longer-lasting emulsions



Etho-chemicals—Armour's oil-soluble, water-dispersible emulsifiers—are especially effective in toxicant formulations. When used to form an emulsifier concentrate, such chemicals as Ethomeen S/15 make possible rapid, long-lasting emulsions with a minimum of agitation in *either hard or soft water!*

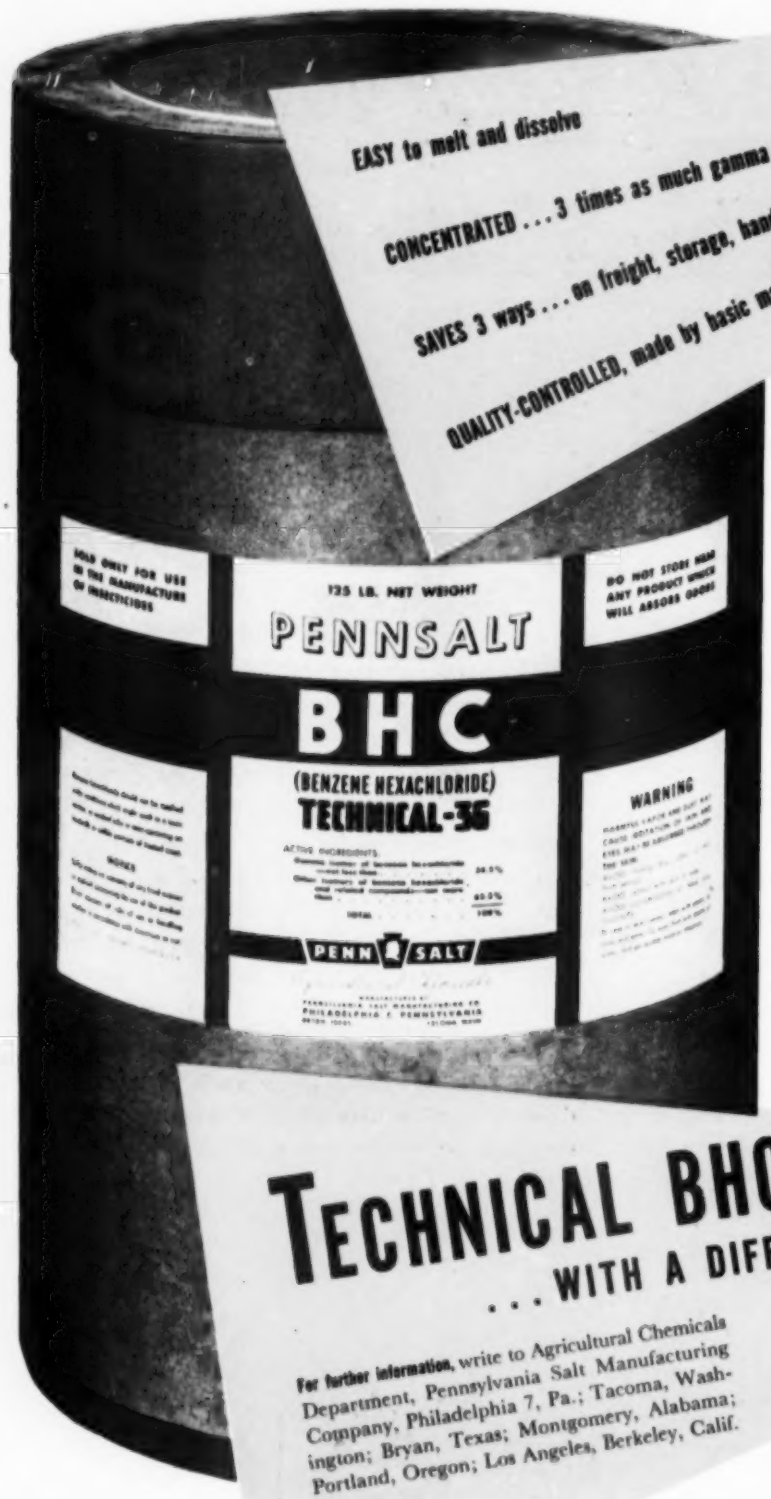
2, 4-D isopropyl ester, for example, can be emulsified easily by a combination of two mildly cationic Ethomeens—S/15 and S/12. This combination emulsifier is effective even in extremely low concentrations, providing greater economy.

Ethofat 142/20—another member of the Etho-chemical series—is an excellent non-ionic emulsifier for use with kerosene or xylol as a solvent. Ethofat 142/20 is so efficient that chlordane can be emulsified directly into water without the use of a solvent. Like the two Ethomeens, Ethofat 142/20 is not affected by water hardness.

Toxaphene, DDT, chlordane, 2, 4-D are only a few of the toxicants that can be emulsified easily and economically with these and other Armour chemicals. Write today for further information, including prices, on our complete line of emulsifiers.

ARMOUR
CHEMICAL
DIVISION

Armour and Company • 1355 West 31st Street • Chicago 9, Illinois



Compare these advantages! Then you'll see why *Pennsalt BHC Technical-36* is preferred by formulators everywhere!

EASY TO USE. You can melt it and apply it to the diluent with ease, either alone or in combination with DDT. *Pennsalt BHC Technical-36* is a waxy solid with low melting range. You can use it for either liquid or dry formulations.

BETTER IN FORMULATION. Enables you to give your customers a finished product containing *more* of the gamma isomer, *less* of the other isomers of BHC.

SAVES MONEY 3 WAYS. Lower freight charges . . . less storage space . . . less time and effort spent in handling. *Pennsalt BHC Technical-36* is 3 times as concentrated as most Benzene Hexachlorides.

PROVED IN ACTUAL USE. Formulators and compounders all over the country are ordering and re-ordering this product.

MADE FOR THE JOB. Pennsalt manufactures chemicals right from the ground up . . . makes them "just right" for their specific jobs.

TECHNICAL BHC
. . . WITH A DIFFERENCE!

For further information, write to Agricultural Chemicals Department, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.; Tacoma, Washington; Bryan, Texas; Montgomery, Alabama; Portland, Oregon; Los Angeles, Berkeley, Calif.

Pennsalt Chemicals

Progressive Chemistry
for over a Century

The name BAGPAK is a standard of leadership, and of quality...for BAGPAK means *complete* production control in bag manufacture, from the planting of seedlings which eventually produce pulp, to the delivery of the finished sack to your plant —in fact, even to the furnishing of special filling and closing machines to insure the best protection for your product.

Multiwall Paper Shipping Bags are described in the above brochure. For your copy, write to Bagpak Division, International Paper Company, 220 East 42nd St., New York 17, Dept. D-7

International Paper COMPANY

BAGPAK DIVISION

BRANCH OFFICES: Atlanta • Baltimore • Baxter Springs, Kansas • Boston • Chicago • Cleveland • Denver • Detroit • Kansas City, Kansas • Los Angeles • New Orleans • Philadelphia • Pittsburgh • St. Louis • San Francisco • IN CANADA: The Continental Paper Products, Ltd., Montreal, Ottawa, Toronto

New DuPont CMU New Profits For

NOW! Offer CMU Weed Control As A New Service to Industrial Plants

Here's a powerful new weed killer that offers many advantages in controlling unwanted vegetation . . . and new opportunities for service and profit to people who have the know-how and the equipment to apply it.

Many Places to Use It

Just take a look at the plants you service, or pass in your travels. Note all the spots where weeds and grass are a fire hazard, an eyesore, a haven for vermin or just a plain nuisance: around storage areas, stockpiles, pole yards, rail sidings, foundations, storage tanks, parking lots, signposts, along fences.

Easy to Apply

As little as one application of 1 or 2 pounds of CMU weed killer per 1,000 square feet (40 to 80 pounds per acre) usually keeps the ground bare for an *entire* growing season or longer. All you do is mix it with water and apply it in your regular spray equipment. CMU is non-flammable, non-volatile and non-corrosive to equipment. Storage and handling are a minor problem indeed.

You Are the Key Man

Cash in this spring on this new field, this tremendous new market for your services. Most of the people who need CMU also need you to apply it for them. You have the know-how and the equipment.

Du Pont Sales Helps

CMU is nationally advertised to all types of industry. To help you sell your service and make yourself known in this field, Du Pont has a sales-promotion kit to which you are welcome. Why not ask for it now? Use the coupon or write on your own letterhead.

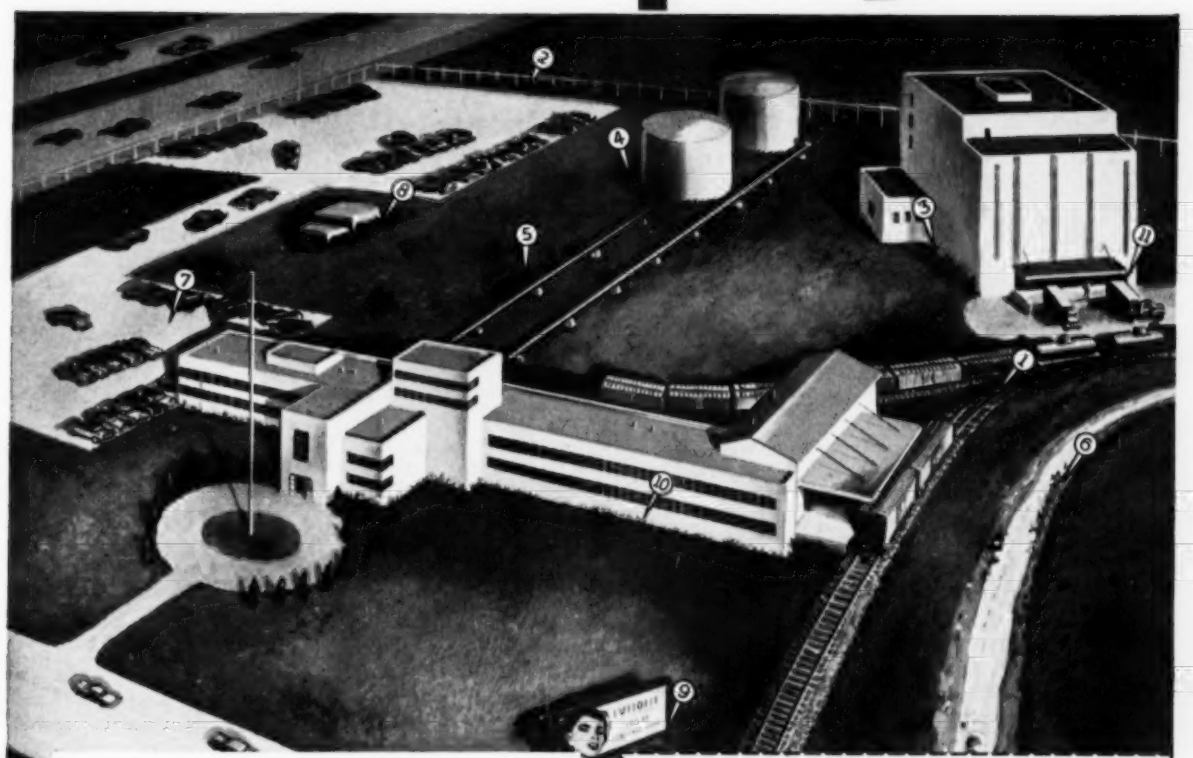
DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Write for full

on

Weed Killer Offers Custom Sprayers



ELEVEN AREAS around this typical industrial plant need CMU weed control to cut fire hazards and costly maintenance. Around—**(1)** rail siding, **(2)** fence rows, **(3)** warehouses, **(4)** storage tanks, **(5)** pipe lines, **(6)** drainage ditch, **(7)** parking field, **(8)** storage areas, **(9)** billboards, **(10)** foundations, **(11)** truck loading area.

information DuPont CMU

A

CHECK HERE!

E. I. du Pont de Nemours & Co. (Inc.)
Grasselli Chemicals Dept.
Wilmington, Delaware

( ) Please send me full information on CMU, including your sales promotion kit for custom sprayers.

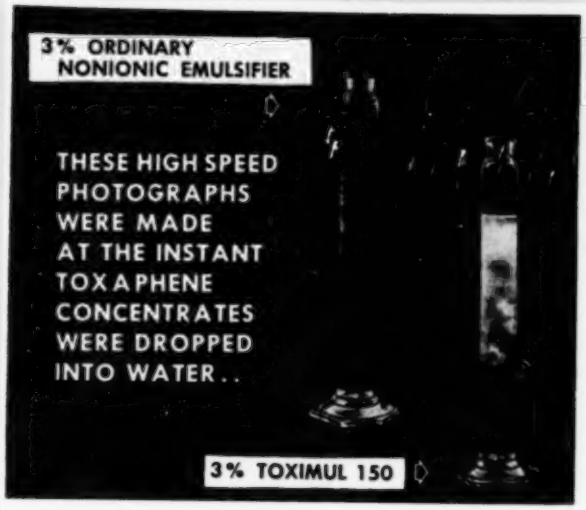
( ) Please have a Du Pont technical service man call.

Name_____

Firm_____

Street_____

City_____ State_____



A NEW EMULSIFIER

Specifically for Toxaphene..

TOXIMUL 150

As a result of the growing trend toward low gallonage liquid sprays in cotton crop protection, more efficient emulsifiers are required than hitherto available.

TOXIMUL 150 has been developed specifically to fill this need for an outstandingly effective emulsifier for Toxaphene and Toxaphene DDT systems, giving spray concentrates with the following important properties:

- *Flash emulsification, with only 3% emulsifier*
- *Equal effectiveness in hard or soft water*
- *Slow creaming rates, and no oiling*
- *High storage stability*
- *Low Cost*

SEND TODAY FOR SAMPLE AND BULLETIN

Also

TOXIMUL 250

An exceptionally effective emulsion for Chloro-IPC. Flash dispersion in soft and hard water.

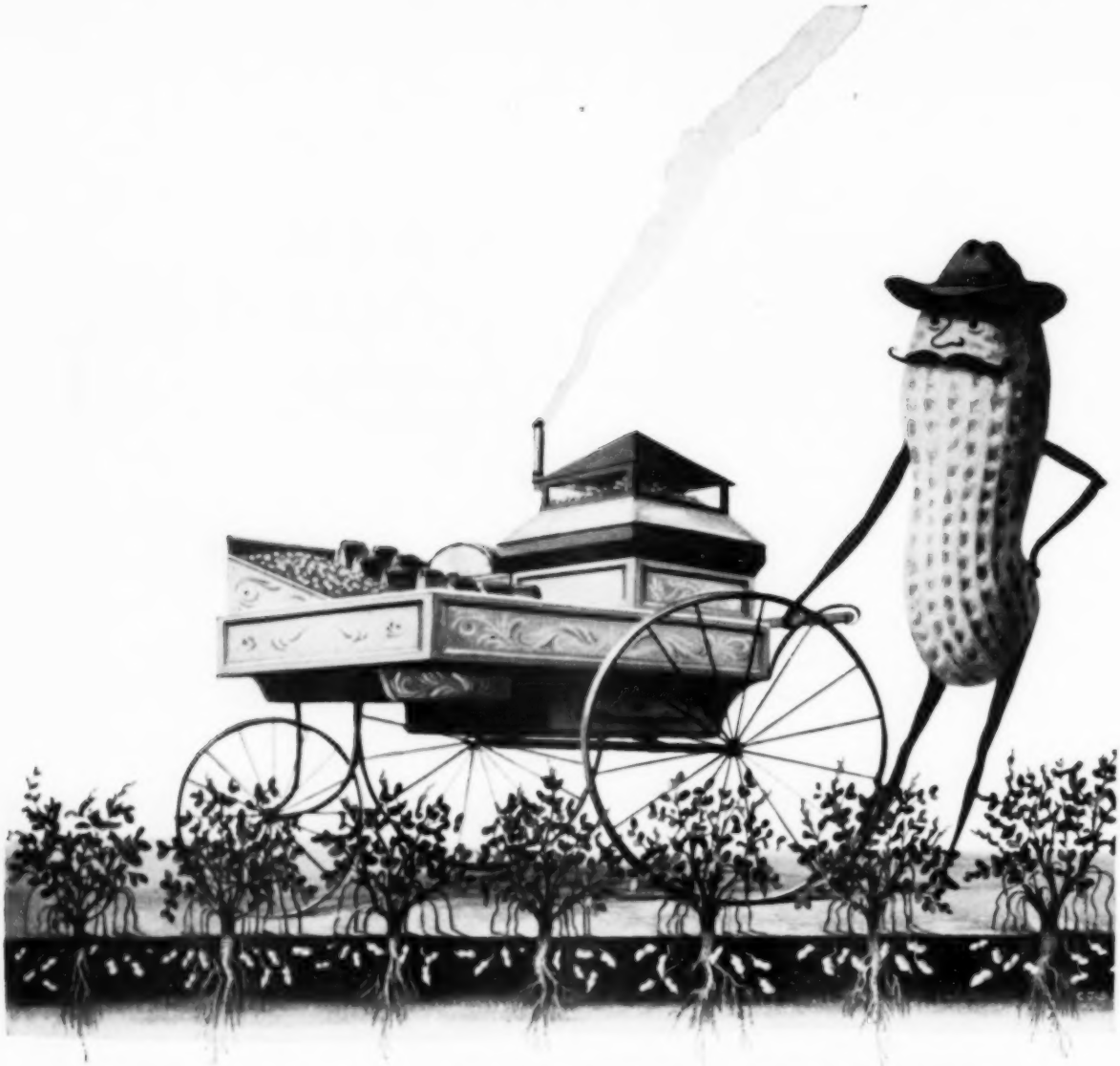
NINOL

Detergents — Emulsifiers

NINOL LABORATORIES

1719 S. CLINTON • CHICAGO 16 • PHONE CHESAPEAKE 3-9625

In Canada: Chemical Developments of Canada Ltd., 420 Lagauchetiere Street W., Montreal 1, Quebec



YOU CAN DO IT FOR PEANUTS

With the ever-increasing menace of rootworm damage to peanuts and corn, more and more growers are turning to aldrin . . . highly effective killer of rootworms.

Successful use of aldrin in 1952 will almost certainly mean a marked increase in demand this season. Make sure you are carrying an adequate supply of aldrin to satisfy this new approved application of a preferred insecticide.

It's easy to apply aldrin to the soil. As a dust, it can be mixed with fertilizer and applied by conventional fertilizer-spreading equipment.

By recommending aldrin fertilizer mixtures you can be sure that your customers are using the best insecticide yet developed for rootworm control.

Write for the latest technical information on formulation and methods for applying aldrin.

Julius Hyman & Company Division

SHELL CHEMICAL CORPORATION

CHEMICAL PARTNER OF INDUSTRY AND AGRICULTURE
P. O. BOX 2171, DENVER 1, COLORADO

ATLANTA • CHICAGO • HOUSTON • LOS ANGELES • NEW YORK • SAN FRANCISCO • ST. LOUIS

Northeastern Weed Control Conference Discusses

New Chemical Herbicides

R. H. BEATTY, American Chemical Paint Co., Ambler, Pa., was elected president of the Northeastern Weed Control Conference at the group's seventh annual meeting, held at the New Yorker Hotel, New York City, January 7-9. Mr. Beatty succeeds C. E. Minarik, Camp Detrick, Maryland. Other officers named at the meeting included Albin O. Kuhn, University of Maryland, College Park, vice-president; and W. S. Jacob, Cornell University, Ithaca, N.Y., secretary-treasurer. Mr. Jacob was re-elected, while Mr. Kuhn succeeds President Beatty as vice-president.

The program covered a wide range of problems in connection with chemical weed control, including aquatic weed control; elimination of unwanted vegetation in cotton, grains and vegetables; and various pre-emergence techniques.

Dr. Roy L. Lovvorn, head, Division of Weed Investigations, Bureau of Plant Industry, Soils and Agricultural Engineering, U.S.D.A., Beltsville, Md., brought before the group some of the opportunities in weed work. He said that between 25 and 30 million pounds of 2,4-D herbicides are used annually in the United States and that other herbi-

New Officers Named by Northeastern Weed Conference

Below: R. H. Beatty, (center) newly-elected president of the Northeastern States Weed Control Conference, with Albin O. Kuhn (left), new vice-president and W. S. Jacob, (right) secretary-treasurer . Mr. Jacob was re-elected.

sides have also made spectacular progress in weed control.

Despite this increasing use, he said, we are not yet utilizing the knowledge we already have. As an example, he cited the employment of 2,4-D in the control of weeds in small grains which he described as "one of the most beautiful stories we have in the herbicidal world." Yet, in 1949, only a relatively few acres were sprayed with this compound. The 18,500,000 treated acres are not enough, he said, then asked what happened to the 127,500,000 other acres. "Certainly, many of these acres needed spraying," he commented. Somewhat the same story is true in corn, where the post-emergence treatment of weeds has become accepted practice. Out of 85,000,000 acres, only some five million have been treated, Dr. Lovvorn declared.

Another matter needing attention in weed control is along the line of more profound research. He said that the cream has been skimmed off in many instances and that the remaining distance must be negotiated more slowly. "From now on to the end of the row, the hoe hand that is trained in fundamentals will be the one most likely to succeed." He urged his hearers to keep on searching for more knowledge in weed control.

That the public should be better informed on the subject was emphasized by the speaker. While the selling program must be enlarged, it should be through informing the public of facts, rather than by pressuring them into buying products which may not have been thoroughly evaluated. Mere knowledge that a product kills weeds is not enough, he said. Until we know how it kills, or why it occasionally fails to kill plants, the job is not done.

Aquatic Weed Control

ROBERT B. Balcom, U. S. Bureau of Reclamation, discussed control of aquatic weeds in his talk before the conference. He pointed out the hazards and difficulties brought about by the presence of weeds in irrigation and navigation canals, particularly in the west, and emphasized the difficulty of controlling such weeds by mechanical mears.

Emergent waterweeds (those growing up through the water) are particularly troublesome in drains. Cattails, bulrushes and watercress are some of the more prominent ones, and control previously had been attempted by dragging heavy chains with the ends attached to tractors on each bank. This brought up many problems.

The development of chemical weed control has opened up a whole new field in the control of aquatic weeds, just as it has for land weeds, he said. Copper sulfate has been successful in control of algae, and where chemical control of submerged weeds can be utilized, it has decided advantages over mechanical methods, it was pointed out. The treated weeds usually turn brown within a few hours, settle to the bottom and disintegrate. This prevents the setting loose of uprooted plants, as is the case with chaining, and weeds are thus kept from floating down stream to start new infestations, or to clog the waterway.

Early use of 2,4-D on cattails was found effective, but 3 or 4 applications each year for two years were required to get complete kill. Later, the addition of TCA to the sodium salt of 2,4-D increased the kill, so that the formula now used in the Imperial Valley of California, where most of the tests were made, is one pound of sodium 2,4-D to 10 pounds of TCA plus an ionic emulsifier in 100 gallons of water. This is applied at the rate of 300 gallons per acre of plants at the early heading stage.

Mr. Balcom concluded by expressing confidence that greater weed control progress will be made in the future through the concentrated and coordinated efforts of Federal agencies, State departments of agriculture, State College experiment stations and chemical companies, all being backed and aided by the various weed control conferences.

How field-grown cotton at various stages of growth is affected by 2,4-D was discussed by A. David Baskin, U. S. Department of Agriculture. He said that the problem created by the use on cotton of insecticides contaminated with herbicidal compounds, has been of practical importance for several years. These insecticides have been demonstrated by laboratory and field tests to contain a formative compound similar to 2,4-D in toxic effect on plants. In studies during 1952, it was found that lint yields were apparently affected by the interaction of concentration and time of application.

Sprayers Discussed

NEW developments in sprayers for chemical weed control were discussed by Earl D. Anderson, secretary of the National Sprayer and Duster Association, Chicago. He pointed out that developments in mechanical means of application have largely paralleled the developments in weed control chemicals themselves. Equipment for the accurate and economical application of herbicides is an essential factor in a successful weed control program.

Although the literature indicates that crude sprayers were used to apply weed control chemicals as long ago as 50 years, changes taking place within the past seven or eight years have practically revolutionized not only weed conrtol spraying, but also the entire agricultural spraying program.

The NSDA secretary pointed out that with the introduction of 2,4-D, the whole concept of weed control was changed drastically. From the standpoint of sprayers, the most significant change was the successful application at extremely low rates, such as 2 gallons per acre, as compared to rates of from 80 to 160 gallons per acre, common in weed control recommendations previously. Manufacturers of application equipment have kept pace with discoveries of new chemical compounds, he said, pointing out that the two must work as a team for best results.

Use of herbicides for the renovation of pastures was described by

(*Turn to Page* 135)

The Listening Post

Tests for Wheat and Oats Smut Control

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

RESULTS of the 1952 smut control tests have been reported by R. W. Leukel of the U.S. Bureau of Plant Industry, Soils, and Agricultural Engineering, who also discusses some other aspects of cereal disease control. Fourteen materials were tested for the control of bunt (*Tilletia caries* and *T. foetida*) in Ulka spring wheat and eleven for the control of smuts (*Ustilago avenae* and *U. kolleri*) in the Canadian variety of oats.

As in the previous cooperative tests of this nature, the seed was treated and packeted at the Plant Industry Station, Beltsville, Maryland, and sent to the different field stations where it was planted by the respective cooperators, who later also recorded the data on infection.

The following persons cooperated in the tests: D. C. Arny, Madison, Wisconsin; W. E. Brentzel, Fargo, North Dakota; R. M. Caldwell, LaFayette, Indiana; D. M. Coe, Palmer, Alaska; C. S. Holton, Pullman, Washington; B. Koehler, Urbana, Illinois; C. W. Roane, Blacksburg, Virginia; and J. R. Vaughan, East Lansing, Michigan.

The sources of materials, method of inoculating and treating seed and testing its germination, as well as other details of procedure were as in previous tests. In addition to materials included before are several others. They are:

"Setrete"—7% phenyl mercuric ammonium acetate (4% Hg), produced by W. A. Cleary Corporation, New Brunswick, New Jersey. This material is in liquid form and may be applied as a

TABLE 1

Percent emergence from untreated and treated, bunt-infested seed of Ulka spring wheat planted in steamed and in infested soil; and percent of smutted heads in plants grown from this seed sown at eight field stations in 1952.

Seed treatment				Percent emergence*		Percent of heads infected in plots at							Average percent infection
No.	Fungicide	Form	Oz./Bu.	1	2	Urbana Ill.	Beltsville Md.	Madison Wis.	St. Paul Minn.	Fargo N. Dak.	Pullman Wash.	Palmer Alaska	
1	No treatment	—	—	98	81	10.0	12.8	43.1	13.5	3.1	72.0	55.5	30.0
2	Ceresan M	Dust	½	95	94	0	0	1.3	0	0.3	3.0	3.5	1.2
3	Agrox	"	"	98	94	0.2	0.1	4.0	1.4	1.8	9.0	2.1	2.7
4	Mergamma	"	2	88	81	0	0.3	1.5	0	3.3	4.0	0.2	1.3
5	Mergamma	"	1	92	93	1.4	2.0	14.4	0	1.4	19.0	7.4	6.5
6	Dynacide	"	½	94	94	0.7	4.0	11.3	2.0	3.1	21.0	16.8	8.4
7	N. P. 679	"	1	92	62	9.0	9.0	31.5	7.9	9.0	78.0	67.0	30.2
8	Ceresan M	Slurry	½	96	93	0	0	0	0	0	0	0.2	t
9	Agrox	"	"	96	94	0.2	0	0.8	0	0	1.5	0.8	0.5
10	Mergamma	"	1½	93	86	0.2	0.1	0.3	0	0	1.0	2.9	0.6
11	No treatment	—	—	98	83	8.6	13.5	27.3	12.4	1.4	79.0	53.8	28.0
12	Dynacide	Slurry	½	96	95	0	4.0	5.1	0.2	.2	5.0	2.5	2.4
13	M.E.M.A.	Liquid	"	95	99	0	0	0.4	0	0	0.1	0.2	0.1
14	Setrete	"	"	94	94	0	0	0.4	0	0	0.7	0	0.2
15	Tag 331	"	"	92	93	0	0	0.5	0	0	0	0.4	0.1
16	Panogen	"	¾	98	96	0	0	0.1	0	0	0	0.1	t
17	Vancide 51	"	4	97	96	0.2	0	1.3	0.2	0	0.3	2.2	0.6
18	275 D	Dust	2	96	85	0	0	0.3	0	0.2	0	0.1	0.1
19	Mycon	"	2	96	92	0	0	0	0.2	0	0.3	0.6	0.2
20	Orthocide	"	"	96	91	1.2	3.2	2.7	0	1.7	5.0	8.8	3.2
21	Anticarie	"	½	94	74	0	0	1.3	0	0.8	0.3	0	0.3
22	Anticarie	Slurry	"	95	86	—	0	—	—	0	0	—	0
23	Experimental	Dust		94	90	—	9.5	—	—	8.2	66.0	—	27.9
24	"	"		95	92	—	8.0	—	—	10.0	87.0	—	35.0

*1—in steamed soil; 2—in infested soil.

quick wet treatment, or in a slurry treater when properly diluted with water.

"MEMA"—4% mercury in an organic mercuric compound, produced by the Chipman Chemical Company. It was applied at ½ ounce per bushel in an aqueous solution that added less than 1 percent of water to the seed.

"Tag 331"—10% phenyl mercuric acetate (5.9% Hg), produced by California Spray-Chemical Company, Haddonfield, New Jersey, is similar to Setrete in form and composition, but at present (October 1952) is not commercially available. It can be applied in a slurry treater, when properly diluted with water.

"Mycon"—7.7% methyl arsenic sulfide (4.7% arsenic) is made by Pittsburgh Agricultural Chemical Company, Empire State Building, New York. It was used as a dust but may be applied also as a slurry. It is not yet commercially available but may be on the market in 1953.

Germination tests of the treated and untreated lots of Ulka wheat were made in triplicate in steamed uninoculated soil, and in nonsteamed soil, inoculated with *Fusarium graminearum* and *F. culmorum*. The tests were made in pans 4 x 8 x 2 inches, in each of which 100 seeds were planted one inch deep. These small pans were placed on moist blotters in

TABLE 2

Control of loose and covered smuts in Canadian oats grown from naturally infected seed, treated with different fungicides, and sown in triplicated rod-rows at field stations in eight States and Alaska in 1952.

Treatment Applied				Percent of heads infected in plots at								Average of all stations
				Urbana	Blacks-	Beltsville	Madison	East Lansing	St. Paul	Fargo	Pullman	Palmer	
No.	Fungicide	Form	Oz./Bu.	Ill.	burg, Va.	Md.	Wis.	Mich.	Minn.	N. Dak.	Wash.	Alaska	
1	Check	—	—	7.0	26.2	15.7	16.4	14.9	11.4	2.8	10.0	3.8	12.0
2	Ceresan M	Dust	½	0	0	0	0	2.6	0	0	0	0	0.3
3	Agrox	"	"	0.3	0.7	0	0.8	0	0	0.1	0.3	0.2	0.3
4	Mergamma	"	2	0.2	0.4	0	0.1	1.0	0	0.2	1.6	0	0.4
5	Mergamma	"	1	0.1	1.1	1.3	1.3	2.5	0	0.4	0.8	0	0.8
6	Dynacide	"	½	0.6	4.2	0.3	2.6	6.4	0.1	4.5	2.8	0.2	2.4
7	N. P. 679	"	1	0.7	5.4	2.5	4.5	8.0	1.0	1.8	1.8	0	2.9
8	Ceresan M	Slurry	½	0	0	0	0	0	0	0	0	0	0
9	Agrox	"	½	0.1	1.6	0.3	1.3	0	0.1	0.4	0.3	0	0.5
10	Mergamma	"	1½	0.2	2.9	0.6	2.6	2.8	0.1	3.0	3.3	0	1.5
11	Check	—	—	6.4	21.1	17.0	15.8	23.8	10.8	5.1	14.0	1.3	12.8
12	Dynacide	Slurry	½	1.7	4.6	0	1.4	1.4	0.1	3.4	0.3	0.1	0.9
13	M.E.M.A.	Liquid	"	0.8	0.2	2.0	5.3	22.8	0.1	3.6	5.0	0.6	9.1
14	Setrete	"	"	0.2	0.2	0.7	0.5	3.2	0	2.1	1.2	0.1	0.9
15	Tag 331	"	"	0.2	0.3	0.5	0.4	1.2	0	1.3	0.1	0.1	0.5
16	Panogen	"	¾	0	0	0	0	0	0	0	0	0	0
17	Vancide 51	"	4	0.3	2.4	0.8	1.9	2.5	0	1.5	2.0	0.3	1.3
18	Mycon	Dust	2	0	0	0	0	0	0	0	0	0	0
19	Experimental	"	2	5.3	33.0	15.5	26.0	—	—	—	—	—	20.0
20	Experimental	"	4	4.2	30.8	10.7	14.2	—	—	—	—	—	15.0

TABLE 3

Effect of treatment with different fungicides, and of different periods of storage after treatment, on seedling stands and on seedling infection in Southland oats. Gainesville, Florida, 1952.

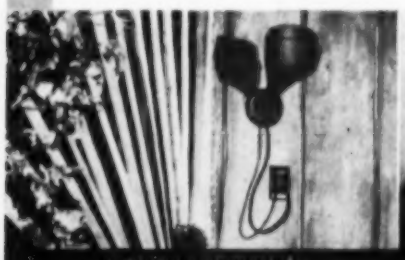
Seed treatment		Percent stand[a] from seed stored			Average percent infection	Protection index[c] on seed stored			Average index
No.	Fungicide	4 days	28 days	49 days		4 days	28 days	49 days	
1.	Ceresan M	85	97	89	5.7	14.9	17.0	15.6	15.8
2.	Panogen conc.	94	93	89	12.4	7.6	7.5	7.2	7.4
3.	Panogen diluted	87	90	88	11.8	7.4	7.6	7.5	7.5
4.	Vancide 51	81	90	94	46.9	1.7	1.9	2.0	1.9
5.	Arasan	88	98	92	76.8	1.1	1.3	1.2	1.2
6.	Spergon	88	94	84	78.0	1.1	1.2	1.1	1.1
7.	Phygon	89	93	93	34.9	2.6	2.7	2.7	2.7
8.	Untreated	86	98	98	83.9	1.0	1.2	1.2	1.1
L. S. D.									
	5% level								0.7
	1% level								1.0

[a]Average of 8 replications
[b]Total number of seedling infected divided by the total number examined.
[c]The average percent stand divided by the average percent infection.

FORMULATORS!

Only ORTHO Lindane*

does all these jobs—so well!



vaporizing equipment

household pest control

livestock pest control

human parasite control

protects food processing plants

—and gives you all these extras:

GUARANTEED GAMMA —minimum pure gamma isomer 100%. ORTHO Lindane assures you of true Lindane quality actually higher than minimum Government requirements for pure Lindane.

EASY FORMULATIONS —easily handled—easily formulated as a spray or dust. ORTHO Lindane particles are dry, free-flowing. Easily ground to micro-size.

STABILITY —chemically stable.

MANUFACTURING "KNOW-HOW" —made exclusively by the original manufacturers of Lindane in the U.S.A.

*ORTHO Lindane, a real profit-maker, is a truly amazing insecticide offering high potency, rapid action, and residual control. Kills more than 200 varieties of insects by contact, vapor action, and stomach poison.

always—you profit with ORTHO

For complete information, "Story of Lindane," write:

CALIFORNIA SPRAY-CHEMICAL Corp.

Portland, Ore.
Sacramento, Calif.
San Jose, Calif.
Fresno, Calif.
Whittier, Calif.
Caldwell, Idaho
Maryland Heights, Mo.
Oklahoma City, Okla.
Orlando, Fla.
Shreveport, La.
Fennville, Mich.
Elizabeth, N. J.
Medina, N. Y.
Goldsboro, N. C.

Home Office: Richmond, Calif. • 25 Additional Branch Offices

T.M. REG. U. S. PAT. OFF.: ORTHO

World leader in scientific pest control

ORTHO

SCIENTIFIC PEST CONTROL

larger covered pans. The pans were kept at 10° C. for ten days and then at 20° C. until emergence was complete. The data on emergence are shown in Table 1.

Experimental Results

IN the steamed soil none of the fungicides, with the possible exception of "Mergamma" applied at 2 ounces per bushel, had any depressing effect upon emergence. With 98 percent emergence from untreated seed, benefits due to treatment could hardly be expected.

In the infested soil, emergence was improved by all treatments except "(2 ounces)," N. P. 679," and "Anticarie". It is not clear why the two latter materials seemed to depress emergence in infested soil, while not affecting it significantly in steamed soil.

Only eight of the 22 treatments reduced the average bunt infection to less than 0.5 percent. When a material was applied both in slurry and in dust form, the slurry form of treatment was the more effective in bunt control. As a class, the materials applied as liquid treatments were more effective in bunt control than the dusts or slurries.

In the control of oat smuts (Table 2) only "Ceresan M" slurry, "Panogen," and "Mycon" were 100 percent effective at all of the nine stations. All of the other treatments, except "Dynacide" and, at some stations, "N P. 679" and "Vancide," gave fairly good control. The highest percentage of infection occurred at Blacksburg, where seven treatments (five materials) allowed more than 1 percent smut.

Perhaps the poorest control of oat smut was obtained at Fargo, where, although the checks averaged only 4 percent infection, eight treatments with seven materials allowed over 1 percent smut. At St. Paul, where the checks averaged 11.1 percent infection, ten treatments eliminated smut completely, and all the rest except one allowed a mere trace.

These seeming inconsistencies are pointed out to emphasize the importance of testing fungicides under a variety of conditions and over a period of several years before making a final evaluation of their effectiveness. At times, certain materials that have been used as standards of comparison for several years because of their consistent efficiency seem to allow an unusually high percentage of infection in a single row. The discrepancy may be due to human error or to some other unobserved cause. Untreated seed, or seed treated with an ineffective material and sown next to a row of effectively-treated seed, may inadvertently be carried into an adjacent row by wind, water, or some other agent. Seed envelopes may become misplaced and the seed sown in the wrong row in spite of the usual precautions. Such occurrences, although rare, may offer the only logical explanation for an extreme

(*Turn to Page* 127)

Some New Insect Records Reported in 1952

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is connected with the Division of Insect Detection and Identification, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the United States.

By Kelvin Dorward

DURING the past year, reports received by the Economic Insect Detection and Reporting Section from entomologists and other cooperators throughout the country, contained information relative to insects found for the first time in the United States. These reports also contained records of insects known to be in this country, but new to the particular state from which they were reported.

One of the insects reported for the first time in the United States was a scale insect *(Lepidosaphes destefanii)* on olive. This insect was collected near Cloverdale, Sonoma County, California, April 3, 1952. Literature shows that this pest also occurs in the Mediterranean area. Another scale insect *(Poliaspis Pini)* reported for the first time in this country was found on pine at Baltimore, Maryland. This scale is also known to occur in Japan and China. Still another insect reported for the first time in the U. S. was the cotton stem moth *(Platyedra vilella)* which was collected from hollyhock at Mineola, Long Island, New York. Larvae of this insect were taken in 1951, but no adults were obtained at that time. Moths, pupae and lavae were collected in 1952 and this permitted positive identification. This insect has been reported previously from southern Russia, Iran, Iraq, Asia Minor, France and Morocco. Principal food plants are wild malvaceous plants, but cotton has been attacked by it in southern Russia, Iran, Iraq and Morocco. During 1926-28 life history studies were carried on in Uzebestan, (Uzebek, southern Russia). It was found in that area that there are at least two generations; the first develops entirely on *althaea officinalis* and the second on cotton. The insect caused serious damage to cotton in Iran (Persia) in 1932. During 1933, life history studies were carried out in Iran, and there were found to be five generations during the year with the first being confined to wild plants. Additional information relative to this insect in the United States will be obtained during the coming year. Among the insects known to be in

the United States but reported in additional states during 1952, was the alfalfa weevil *(Hypera postica)*. This insect, one of the worst pests of alfalfa, was not known to occur east of the Mississippi until 1952 when it was reported from Delaware, Maryland, New Jersey, Pennsylvania and Virginia. (See page 65, *Agricultural Chemicals*, June, 1952, for a more detailed discussion). One viable cyst of the golden nematode (*Eterodera rostochiensis)*, a serious pest of white potatoes, was found on a small farm near Matawan, New Jersey. Evidence points to this infestation originating from contaminated foreign burlap bagging. Tomato russet mite (*Vasates destructor*) was reported for the first time from Massachusetts. Michigan, New Jersey, Pennsylvania, and Illinois. The Massachusetts infestation was in a greenhouse and the Michigan report stated that the mite was found for the first time in that State under field conditions.

Other new state records include the imported fire ant *(Solenopsis savissima* v. *richteri)* in North Carolina where it was found in Wake County. In West Virginia, a Japanese weevil *(Cyrtepistomus eastaneus)* was found on forest trees. A pine sawfly *(Neodiprion americanum)* was taken in Maine for the first time, being found at South Portland, and a stinging ant (*Myrmica laevinodis*) was also taken at Eastport, Maine, where a local outbreak occurred. The European earwig *(Forficula auricularia*) was taken in New Hampshire *(Agricultural Chemicals*, Page 61, December, 1952) and an aphis *(Callaphis juglandis)* from walnut in California in Santa Clara County. The vetch bruchid (*Ruchus brachialis*) was taken in Texas for the first time where it was found rather widely distributed in the principal vetch seed growing area in the northeastern part of the State. The sweet clover weevil *(Sitona cylindricollis)* was recorded in Washington at Cheney for the first State record, but evidence indicates the insect has been in the State for several years. Single specimens of the Japanese beetle *(Popillia japonica)* were taken in traps at Maxwell Airforce Base, Montgomery, Alabama and Kelly Field, San Antonio, Texas. These were first records for these States, but there is no evidence that infestations of the insects occur in either State. It is regarded as more than likely the insects "hitch-hiked" aboard airliners traveling over wide areas of the country.

Industry's Role Stressed at Defoliation Conference

MORE than 150 persons attended the 1-day Defoliation Conference, Jan. 16, at Memphis, Tenn., sponsored by the National Cotton Council. They represented the Department of Agriculture, state experiment stations and Extension Services, land-grant colleges, farm and cotton industry groups.

Tentative guides for use of defoliants on cotton were distributed at the close of the conference Friday afternoon. These were prepared by technical workers after an all-day, pre-conference session Thursday.

Sound cultural practices for mechanical harvesting also contribute to best defoliation, speakers on the program Friday pointed out. They recommended a higher rate of seeding to gain more cotton plants, thickly spaced, thus reducing likelihood of rank cotton in which the operation of mechanical harvesters is difficult.

Such operations as irrigation and fertilization also are important to the efficiency of defoliation, they explained, pointing out that fertilizer generally should be applied early in the season because late season application of nitrogen, particularly, stimulates growth which interferes with defoliation.

Both insect control and weed control are important to defoliation, the group agreed. Poor control, in many cases, results in a leafy, vegetative plant, poorly fruited, and difficult to defoliate. Heavily fruited plants, on the other hand, defoliate easily.

Application of defoliants at the right stage of growth of the plant is essential for best results. Proper physiological condition was described as when the plant has stopped its fruiting cycle, "not active but still not dried out — fully mature but not dead."

Farmers were cautioned about use of "hot defoliants"—too-potent chemicals which may kill the entire cotton plant. Killing the plant stops development of bolls, resulting in immature cotton fibers.

Bottom defoliation — application of chemicals to the lower portion of the cotton plant—is being practiced extensively now in irrigated sections where cotton is thick and rank, speakers explained. This allows air and sunlight to get into the lower part of the plant, hastening bottom crop maturity while allowing full development of top bolls.

Dr. W. H. Tharp, Beltsville, Md., principal physiologist, division of cotton and other fiber crops and diseases, USDA, was general conference chairman. Speakers summed up cotton defoliation research in 1952, describing their work in the Far Western cotton producing areas, Oklahoma and Texas, and in the Rain Belt.

Others discussed progress in abcission research, in application equipment and effects of defoliation on yields and products.

The role played by industry in cotton defoliation was described in considerable detail by B. W. Walworth, American Cyanamid Co., New York. He described steps taken by industry in the evaluation and development of new defoliants. In the first place, he said, every company in the business is constantly directing its efforts towards finding better and more efficient defoliants.

The next step, he said, is to gain all the information possible on the effect of a new defoliant on the plant. This is generally a coopera-

(*Turn to Page* 121)

Suppliers' Bulletins

Separator Bulletin

Dings Magnetic Separator Co. offers a bulletin C-1205-A, describing the use of its line of non-electic "Perma Plate" magnets for installation in chutes, ducts, over belts etc. to keep bits of iron out of grinders and other equipment. The magnetic separator is said to be adaptable to all types of chemical manufacture. Write for Bulletin C-1205-A, Dings Magnetic Separator Co., 4745 W. Electric Ave., Milwaukee 46, Wisconsin.

•

New Vibrating Screen

A new style vibrating screen for the sizing and processing of bulk chemicals, has been announced by Hewitt-Robins Inc., 666 Glenbrook Rd., Stamford, Conn. The new screen will handle heavier loads than previous models, the announcement states. It is equipped with a heavier yoke and mounted on coil springs instead of leaf springs formerly used. The springs are encased in rubber. All units will have 3-inch discharge lips. Both single and double deck models will be available, and the single deck model can be converted to two decks.

•

C & C Booklet Out

A new book describing the chemical family, "Carbowax Polyethylene Glycols," has just been published by Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation. The book presents formulas showing the varied uses of the water-soluble liquid and solid polyethylene glycols, and the methoxy polyethylene glycols in various industries including the pharmaceutical, and agricultural. A section on physical properties employing tables and charts characterizes these compounds. Shipping and storage data for these compounds are also presented.

Another feature of the 50-page book is a section devoted to the technical and U.S.P. specifications of the polyethylene glycols as shipped by Carbide and Carbon. Complementing these specifications are complete and detailed descriptions of the test methods recommended by the company to assure that the commercial material meets the specifications listed.

Copies of this new book, "Carbowax Polyethylene Glycols" (F-4772) are available from Carbide and Carbon Chemicals Company, 30 East 42nd Street, New York 17, New York.

•

Hahn "Hi-Boy" Described

Hahn, Inc., Evansville, Ind., has recently placed on the market its 1953 version of the "Hi-Boy" sprayer, powered by an 8½ HP gasoline motor. According to the makers, the "Hi-Boy" is designed for spraying for control of cotton pests, corn insects and weeds and can be used for all types of truck crop spraying, and control of weeds in small grains. The equipment can be used for spraying corn, cotton, soy beans, wheat and oats at any stage of growth, according to the manufacturer.

The spray boom is fully adjustable from heights of 18 inches to 8 feet while the frame clearance is 63 inches. Full information is available from the company.

•

Mixers are Described

Descriptive material on the Rodgers line of blenders and batch mixers is available from the company. The machinery is said to be well adapted for use in mixing dry powders, semi-liquids, pastes, and granular materials. Claimed by the manufacturers to be easy to clean, dust-tight, water-tight and leak-proof, the machines also have ball-bearings and other features lending themselves to easy-running performance. Write for catalog No. 43, George G. Rodgers Co., Inc., 2401 Third Ave., New York 51, N. Y.

•

Bulletin on Spray Nozzles

Schutte and Koerting Co., Cornwells Heights, Bucks County, Pa., has issued Bulletin 6-A which contains technical details on the line of atomizing and spray nozzles manufactured by the company. Atomizing nozzles, spray nozzles, and spray nozzle clusters are treated in separate sections of the bulletin. Information given for each type of spray nozzle includes: construction details, spray characteristics, and capacities. Dimension tables, capacity charts, and drawings supplement text material.

Copies of Bulletin 6-A are currently available, from Dept. J-K of the firm.

•

Dorr Booklet Available

The Dorr Company has announced availability of a new technical reprint "The Manufacture of Phosphoric Acid by the Wet Process," by W. C. Weber. It has been reprinted from the book "Phosphoric Acid, Phosphates and Phosphatic Fertilizers," by William H. Waggaman, senior mineral technologist, Bureau of Mines, U. S. Department of the Interior. An American Chemical Society Monograph, the book is claimed to be the most complete treatise yet published in its field.

The chapter on wet-process phosphoric, consists of 36 pages of factual information on all phases of phosphoric acid manufacture by the sulfuric acid or wet process. The chemistry of strong acid production is discussed and major manufacturing developments are traced down to the present day. Twelve pages are devoted to equipment (crushing, grinding, agitation, filtration, etc.) and describe the latest types.

Write to The Dorr Company, Barry Place, Stamford, Conn., for a copy.

DAVISON

GRANULATED SUPERPHOSPHATE offers 3 way Control

1. STORAGE CONTROL—will not take or lump while in storage.

2. APPLICATION CONTROL—drills free and even . . . does not bridge over in the drill.

3. FOOD CONTROL-supplies uniform amount of plant food at desirable rates.

Davison's Granulated Superphosphate with 3-way control can mean added sales for you!

No longer is it necessary for you or the farmer to worry about lumping or caking . . . Davison's Granulated Superphosphate will store without becoming hard or caked. And when the farmer starts to apply Granulated Superphosphate in the field he will find there is no dusting nor will it bridge over in the drill. Granulated Superphosphate drills freely and evenly giving complete coverage. Because of the granular structure, plant food is released at desirable rates.

For added sales points be sure to get *Davison's Granulated Superphosphate with the 3-way control!*

Progress Through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS.

AGRICULTURAL CHEMICALS INDEX of ARTICLES 1952

Articles are cross-indexed by listing the principal word of the title as well as the proper name of the article. Index by authors' names is also included.

FOR QUALITY PRODUCTION OF ALL TYPES OF INSECTICIDE POWDERS:

use the versatile

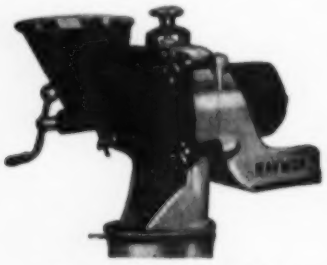
Raymond WHIZZER EQUIPPED ROLLER MILL

SPECIAL ADVANTAGES

Clean, dustless, automatic production.

Slow speed of grinding elements combined with air cooling and conveying system eliminates artificial cooling of material.

Whizzer Separation provides close fineness control and insures uniformity of product.



Raymond Laboratory Mill for handling small batches of material for test runs

This is a wide utility grinding mill which may be used for economically handling all of your insecticide powder production — whether it involves regular field strength, high concentrates, or sulphur.

It does an efficient job of superfine grinding and intimately blending the various materials, producing products with fineness up to 99% or better passing 325 mesh. It is available in several sizes to provide for large or small plant capacities.

For consistent product quality and dependable roller mill economy in both operation and maintenance, specify Raymond equipment.

For further details on Raymond insecticide grinding mills write for Bulletin No. 68.

COMBUSTION ENGINEERING – SUPERHEATER, INC.

1314 NORTH BRANCH ST.
CHICAGO 22, ILLINOIS

Raymond
PULVERIZER DIVISION

SALES OFFICES IN PRINCIPAL CITIES

1952 AUTHORS

Technical Briefs

Sulfur in Soil Rot Control

Soil rot, an important disease of sweet potatoes in sandy soils of southeastern Iowa, has been controlled effectively by sulfur as a soil treatment. The disease (*Streptomyces ipomoea*) reduces both stands and plant vigor and fleshy roots are disfigured and distorted by its attacks. Following the sulfur treatment, total yields and plant vigor are often increased and the appearance of the fleshy roots was appreciably improved. Although disease was present in soils with pH as low as 4.7, practical control was usually obtained somewhere around pH 5.0. In these soils, total yields and plant vigor were adversely affected at approximately pH 4.0.

The 800 lb. sulfur rate provided conditions for optimum plant growth and satisfactory disease control. Maximum soil rot control was obtained with 1200 lbs. of sulfur, but in certain locations this rate was above the optimum for plant growth. Disease control was not satisfactory with 400 lbs. of sulfur.

There was no evidence that stem rot (*Fusarium oxysporum* f. *batatasQ* had been influenced by variation in hydrogen-ion concentration of the soil.

Summary of "Sulfur Soil Treatment for Control of Sweet Potato Soil Rot Incited by Streptomyces Ipomoea," by W. J. Hooker and Lewis E. Peterson, in Phytopathology, November, 1952.

•

Malathon for Two Pests

Successful control of greenhouse mealybug and the Euonymus scale with malathon has been reported by the Connecticut Agricultural Experiment Station, New Haven. John C. Schread, entomologist, found that malathon gave a 100% kill of young and adults when 1 quart of 50% emulsion in 100 gallons of water was used. A pressure sprayer was used in the experiments. The application was made when few eggs were present and no repeat treatment was necessary, since none of these eggs hatched. Had a large number of eggs been present, it was regarded likely that a second treatment could have been necessary.

In the case of scale infesting young Euonymus plants in the greenhouse, higher dosages were necessary. Malathon gave satisfactory control at a concentration of 1 gallon of emulsion in 100 gallons of water.

When sprays were applied two weeks after the young had hatched, crawlers were nearly all killed with sprays of 1 pint of malathon emulsion in 100 gallons of water. A second treatment was necessary about a week after the first. In cases of unusually severe infestation, a third treatment may be advisable.

No phytotoxic effects were noted in the Connecticut experiments, the report stated.

•

Spittlebug Control

Insects, including leafhoppers, spittlebugs, and weevils, have been lowering both the tonnage and nutritional value of alfalfa by as much as 50 per cent, according to Dr. R. P. Holdsworth, Jr., E. I. Du Pont de Nemours & Co., Inc., in a talk before a convention of the American Dehydrators' Association, which closed January 14 in Phoenix, Ariz. He reported having seen severe damage to alfalfa crops being blamed on drought or boron deficiency, when the damage was actually caused by the leafhopper.

More than a half-million acres of forage crops were sprayed with insecticides in five eastern and middle-western states during the summer of 1952 to control these tiny pests, it was reported. Spraying early alfalfa growth to control spittlebug

Now!

LINDANE

from

TENNESSEE

TENNESSEE
PRODUCTS & CHEMICAL
Corporation
NASHVILLE, TENNESSEE

Lindane, the newest high-potency insecticide, is putting the biggest bite of all times on insects. Formulations of Lindane applied as recommended by the United States Department of Agriculture control sarcoptic mange and lice on dairy animals . . . are effective sprays for edible field crops and truck gardens. Lindane from TENNESSEE has an important role in the agricultural and household fields for it effectively controls more species and types of plant and animal insect pests than any other insecticide ever used.

Call TENNESSEE for your Lindane requirements. For complete details contact Tennessee Products & Chemical Corp., Dept. AC23, First American National Bank Building, Nashville, Tennessee.

produced increases in the first cutting of hay from an average of 20 per cent in New York State, to almost 100 per cent in Indiana. Sprays during the summer to control leafhoppers produced crop increases ranging from a 16 per cent average in New York to 100 per cent increases in Wisconsin.

•

Naugatuck Develops "Alanap" Herbicide

SINCE the advent of 2,4-D, there has been an intensification of research and development of organic chemicals for herbicidal use and a number of new compounds have been placed on the market. Most of these new weed killers, so far introduced, have acted by contact with healthy, growing weeds.

A new pre-emergence weed killer has been developed by Naugatuck Chemical Division, U. S. Rubber Co. This herbicide, known chemically as N-1 naphthyl phthalamic acid, and by the trade name "Alanap," can be used safely on many truck garden crops, the makers state. The material is also effective against crabgrass on established lawns, they say.

Although not yet ready for marketing, "Alanap" is being tested extensively in various agricultural experiment stations and is expected to be on the market next year on a limited basis, primarily for use on vine crops.

Test results to date have been promising, particularly for crops such as cucumbers, cantaloupes, watermelons, pumpkins, squash, asparagus, snap beans, soybeans, peanuts, sweet potatoes, peppers, carrots, and onions. Tests have also been promising on nursery stock and cotton, the makers say.

Dr. G. F. Warren, associate professor of horticulture at Purdue University Experiment Station, has reported "Alanap" to be particularly effective on vine crops. Muskmelons, cucumbers, and watermelons have shown good tolerance to both pre- and post-emergence applications of the chemical. In field experiments, control of germinating crabgrass was obtained with an application of "Alanap" at the rate of 4 pounds to the acre and there was no adverse effect on the yield or maturity of the muskmelons.

Dr. D. D. Hemphill, associate professor of horticulture at the University of Missouri experiment station, has tested "'Alanap" on cantaloupes, cucumbers, watermelons, squash, asparagus, lima beans, potatoes, and snap beans as a pre-emergence treatment at the rate of 4 lbs. per acre with satisfactory weed control and no adverse effect on the crops. Crabgrass, foxtails and pigweed are particular weed problems in Missouri.

Tests at Naugatuck Chemical's Bethany Laboratory have been made on cotton, soybeans, flax, pumpkins, squash, corn, beans, and carrots with little or no damage to the crops and satisfactory weed control.

"Alanap" is reported to be effective against weed pests such as pigweed, purslane, lambsquarters, quickweed, chickweed, ragweed, carpetweed and crabgrass. Generally, the chemical is more effective as a pre-emergence weed control than as a post-emergence control. Most effective results are obtained when the chemical is applied at planting time or within a day or two thereafter. Effective dosage ranges from 4 to 8 pounds per acre for a broadcast spray applied in any convenient amount of water as long as the oil is uniformly covered. Applied as a band on the row, 1 to3 pounds per acre is effective.

The length of time the chemical is retained in the soil depends upon soil moisture, type, temperature and organic content. In general, however, 2 to 10 pounds per acre of actual treated surface gives good weed control for a period of from 3 to 8 weeks.

Heavy rains occurring immediately after applying the chemical to the soil do not appear to reduce the amount of weed control.

Preliminary tests indicate low toxicity to warm-blooded animals. No adverse effects have been observed in handling large quantities of the chemical either in the laboratory or afield. Extensive toxicological studies are now in progress.

Standard spray equipment delivering 25 to 100 gallons per acre can be used to apply the material as a broadcast spray. The spray tank should have some type of agitation, and it is advisable to clean the spray equipment with a dilute solution of ammonia water after using to avoid contamination of other sprays.

The chemical is being supplied currently as a wettable powder containing 90 per cent active ingredient. Further formulation work is in progress and greenhouse and field trials indicate that modifications of this basic powder may be advantageous.

The purpose of the pre-emergence treatment is to control weed growth, preferably on the row, until the crop is large enough to prevent weed interference or to permit machine cultivation. To insure maximum weed control, it is important that the soil be properly prepared, with soil clods broken up before applications, and the soil should not be disturbed after treatment until cultivation is absolutely necessary.★★

•

Measures Methyl Bromide

Adaptation of a scientific instrument allowing quick and accurate measurements of methyl bromide concentrations when used as an insect-killing fumigant, has been announced by the U. S. Department of Agriculture.

(Methyl bromide, although stored and handled as a liquid under pressure, becomes a gas heavier than air when released for fumigation purposes. It is used for insect control in cottonseed, nursery stock, some fruits and vegetables, flour and cheese, and storage structures such as mills and warehouses. See article on page 40, this issue, of *Agricultural Chemicals.*)

The device is said to take

(*Turn to Page* 123)

serving over 100 principal industries
through ***AA Quality*** factories and sales offices

Air view of A.A.C. plant at Detroit, Mich. . . . 31 A.A.C. factories and sales offices, most of them in or near principal industrial centers, assure dependable service.

AA Quality

for over 85 years
a symbol of quality
and reliability

principal *AA Quality* products

All grades of Florida Pebble Phosphate Rock
AA QUALITY Ground Phosphate Rock
All grades of Commercial Fertilizers
Superphosphate **Sulphuric Acid**
Insecticides and Fungicides
Phosphoric Acid and Phosphates
Phosphorous and Compounds of Phosphorus
Fluosilicates **Salt Cake**
Gelatin **Bone Products**
Ammonium Carbonate

THE AMERICAN AGRICULTURAL CHEMICAL COMPANY
GENERAL OFFICE: 50 CHURCH STREET, NEW YORK 7, N.Y.
30 FACTORIES AND SALES OFFICES, SERVING U.S., CANADA AND CUBA—ASSURE DEPENDABLE SERVICE

INDUSTRY NEWS

Allied Appoints Two in Nitrogen Division

ALLIED Chemical & Dye Corp., New York, has announced two appointments in its Nitrogen Division. John J. Porter has been named executive vice-president, and Malcolm E. Hunter, assistant director of sales, the position formerly held by Mr. Porter. Mr. Hunter has been sales manager of direct application fertilizer materials for the division. The appointments were effective Jan. 1.

MALCOLM E. HUNTER

JOHN J. PORTER

In his newly created post Mr. Porter will be in charge of industrial and export sales, advertising, promotion and market research for the nitrogen division, reporting to F. T. Techter, executive vice-president. Mr. Porter brings to his new assignment an experience of 24 years as a salesman and sales executive. Starting his career with the Barrett Division of Allied in 1923 as an office boy, he later became a sales clerk, salesman, assistant to the general sales manager and then assistant manager. In 1952, with the formation of the new Nitrogen Division by Allied, he was appointed assistant director of sales. Mr. Porter attended the New York public schools and Pratt Institute. He and his family reside in Pompton Plains, N. J. His headquarters are at 40 Rector Street in New York City.

Mr. Hunter joined the Barrett Division of Allied in 1950 as sales manager for direct application materials. Later when this sales activity was transferred to the new Nitrogen division he assumed the same duties there. Mr. Hunter was formerly associated with the Virginia-Carolina Chemical Corporation. Starting as a salesman in 1922 he was subsequently appointed manager of the Columbia, S. C. and Montgomery, Ala. divisions. He served as assistant general sales manager of the company and prior to his coming to Allied was general sales manager of the fertilizer division. A native of South Carolina, Mr. Hunter attended Wofford College in Spartanburg. His home and headquarters are in Richmond, Va.

•

Form New Fertilizer Co.

Nitro-Fertilizer Distributing Co., Inc., Salina, Kansas, recently received a charter to manufacture, wholesale, retail and/or apply fertilizer and gases in all their forms and phases. Capitalization of the firm was reported as $40,000. Resident agent is G. M. McClellan.

•

New DDT Plant in S.A.

A DDT and caustic soda-chlorine plant will be built in the Sao Paulo area of Brazil by a company being formed by W. R. Grace & Co., international industrial and trading concern, American Home Products Corporation, and Instituto Medicamenta Fontoura S/A, prominent Brazilian concern, W. R. Grace has announced. Grace will have a 55% interest in the new company while the other concerns each will have a 22½% share.

The plant will have an initial capacity of about four million pounds of DDT a year and ten tons of chlorine a day. The DDT will be manufactured for general agricultural purposes, household insecticides, and federal and state government use for public health services. At present, Brazil must import all her DDT. Plans call for the new plant to supply the entire national requirements of Brazil. Construction is expected to get under way immediately with completion scheduled for 1954.

The Fontouras are Brazilians who now own and operate pharmaceutical and insecticide businesses. In addition, they are partners in the distribution of some American Home products and currently are building Brazil's first penicillin plant.

American Home Products manufactures a broad line of ethical and proprietary drugs, insecticides, home products, and prepared foods.

W. R. Grace & Co. recently formed a new subsidiary, Grace Chemical Company. Its twenty-million dollar nitrogen plant is now under construction near Memphis, Tennessee. The company plans still further expansion in the chemical industry both in the United States and in Latin America.

Partial aerial view of Naugatuck Chemical test fields and lab at Bethany, Connecticut

Here's where sales are sown!

Here's where Naugatuck chemicals begin—where Spergon®, Phygon® and Aramite* first showed signs of becoming the nationally famous products they are today.

Here's where Naugatuck Chemical's seed protectants, spray fungicides and insecticides of tomorrow must meet the tests of effectiveness, economy, plus ease and safety of use.

Yes, and here's where sales are sown! When the benefits of the Naugatuck chemicals developed here eventually reach the grower, they also reach the supplier and distributor in the form of new sales and new profits.

*U. S. Pat. No. 2,529,494

UNITED STATES RUBBER COMPANY

Naugatuck Chemical Division • Naugatuck, Connecticut

manufacturers of seed protectants—Spergon, Spergon-DDT, Spergon-SL, Spergon-DDT-SL, Phygon Seed Protectant, Phygon Nuggets, Phygon-XL-DDT, Thiram Nuggets—fungicides—Spergon Wettable, Phygon-XL—insecticides—Synklor-48-E, Synklor-50-W—fungicide-insecticides—Spergon Gladiolus Dust, Phygon Rose Dust—miticides—Aramite.

Name Allen Manager

United Chemical Co., Heckathorn & Co., and Agricultural Chemicals Service Co., Richmond, California have announced the opening

FRANK D. ALLEN

of a new sales and service office in Yakima, Washington. Frank D. Allen, entomologist, was appointed manager.

Mr. Allen, a graduate of Stanford University with an M. A. degree, comes to the United Chemical Co. with a number of years of agricultural chemical experience. He was formerly with California Spray-Chemical Corp. in its control laboratory at Richmond. Later, he worked with the American Cyanamid Co. in the Pacific Northwest as entomologist, coordinating research and development work in agricultural chemicals.

The three companies, operating under the same management, maintain sales offices in Sacramento, Fresno, Bakersfield, and Pomona, California. They manufacture and distribute a complete line of agricultural chemicals and fertilizers in the five Western States.

•

Seeks Federal Law Change

A bill to amend the definition of the "ingredient statement" of section 2 of the federal insecticide, fungicide and rodenticide Act of 1947 has been introduced in Congress as H. R. 620, by Rep. Frank E. Smith of Mississippi. The bill would require a more adequate statement of the ingredients in economic poisons; particularly with regard to the inert ingredients.

Under the proposed bill, the definition would read as follows: "The term 'ingredient statement' means a statement of the name and percentage of each active ingredient, together with the name of each inert ingredient and the total percentage of the inert ingredients, in the economic poison; and, in addition, in case the economic poison contains arsenic in any form, a statement of the percentage of total and water soluble arsenic, each calculated as elemental arsenic."

The proponent has indicated that the bill's main objective is to discourage the marketing of low quality insecticides. The new labeling requirements would become mandatory as to any economic poison manufactured or produced a year from the date of enactment of the bill.

Principal differences between the definition contained in the bill and that existing in the Act of 1947, is that under provisions of the new bill, manufacturers would be required to place the name and the percentage of each inert ingredient on the label, in addition to the active ingredients. The existing law requires the naming of only the inert ingredients even in cases where the product is highly toxic to man.

According to Rep. Smith, this provision offers a "loop hole" in the federal law. The state law of Mississippi has already been changed in accordance with Mr. Smith's proposal.

•

Gatts to Fulton Bag Co.

Fulton Bag & Cotton Mills, Atlanta, Georgia, has announced that William P. Gatts, a veteran in the bag industry has jointed their Los Angeles organization. A native of Hannibal, Missouri, Mr. Gatts holds a degree in Chemical Engineering from the Missouri School of Mines.

Although he has been in other types of business for several years, Mr. Gatts had nineteen years experience in the bag business previously. He has just completed a trip to Fulton's New Orleans and Atlanta operations.

Groggins Joins F. M & C. C.

Food Machinery & Chemical Corp., New York, has announced that P. H. Groggins, long associated with the U. S. Department of Agriculture,

PHILLIP H. GROGGINS

has joined the company's chemical division as general chemical consultant.

Mr. Groggins will serve in the New York administrative office, headed by Ernest Hart, executive vice-president, and will be responsible to Dr. M. Y. Seaton, senior vice-president and technical coordinator of the chemical division.

The appointee was retired from government work on January 1 this year after a 26-year career, most of which was spent with the Department of Agriculture. He was with the National Production Authority's chemical section at the time of his retirement.

•

Opens Kansas Plant

Snyder Chemical Co., with a plant in Topeka, Kan., recently opened another plant in Hutchinson, Kan. The two plants have a combined production capacity of 25,000 tons of semi-granular, pellet-conditioned, high analysis fertilizer a year.

Jack B. Snyder is president of the company; Leon F. Baker, vice president; Ruth Dixon, secretary; and Harold R. Krueger, general production superintendent.

The firm is said to be the first commercial fertilizer manufacturer in Kansas, having established its first plant in 1947.

Use this check list to BUILD MORE INSECTICIDE BUSINESS

You can boost your sales this season—or any growing season—by helping your customers solve local insect problems.

Use this handy check list as a guide in recommending the proper insecticidal chemicals. Use the list also as a score sheet on sales potential—to be sure you are selling insecticides to control *all* the insects in the area you serve.

NIRAN* (Parathion—for agricultural use only)

For controlling:

Clover mite
Two-spotted spider mite
Pacific mite
Williamette mite
Strawberry spider mite
Citrus red mite
European red mite
Thrips
Leaf hoppers
Pear psylla
Aphids—many species
Mealy bug
Greenhouse whitefly
Scale insects (crawlers)
Blister beetles
Mexican bean beetle
Colorado potato beetle
Spotted cucumber beetle
Striped cucumber beetle
Flea beetles
Plum curculio
Cabbage worms
Corn earworm
Fall armyworm
Grape leaf folder
Beet webworm
Alfalfa webworm
Celery leaf tier
European corn borer
Codling moth
Grape berry moth
Eye-spotted bud moth
Strawberry leaf roller
Oriental fruit moth
Velvetbean caterpillar
. . . and other insects

NIFOS-T* (TEPP—for agricultural use only)

For controlling:

Two-spotted spider mite
Pacific mite
Citrus red mite
European red mite
Greenhouse thrips
Leaf hoppers
Pear psylla
Cotton or melon aphid
Cabbage aphid
Pea aphid
Green peach aphid
Strawberry aphid
Green bug aphid
Hop aphid
Apple aphid
Bean aphid
Citrus mealybug
Mexican mealybug
Greenhouse whitefly
Scale insects (crawlers)
Lace bugs
Tobacco suckfly
Mushroom flies
. . . and other insects

SANTOBANE* (DDT)

For controlling:

Boll weevil
Corn earworm
Cotton flea hopper
Lygus bugs
Pink bollworm
Colorado potato beetle
Potato leaf hopper
Cabbage worm
Apple leaf hopper
Codling moth
Rose chafer
Japanese beetle
Peach tree borer
Oriental fruit moth
Gypsy moth
Cankerworm
Poultry lice
House fly
Mosquito
. . . and other insects

Reg. U. S. Pat. Off.

Send *for detailed information on properties and formulation of these insecticides. Ask for bulletins on Niran, Nifos-T, or DDT. Write:* MONSANTO CHEMICAL COMPANY, *Organic Chemicals Division, 800 North Twelfth Blvd., St. Louis 1, Mo.*

MONSANTO
CHEMICALS—PLASTICS
SERVING INDUSTRY . . . WHICH SERVES MANKIND

S-D Plant Gets Award

For achieving a record of 1,095 days without a lost-time accident, the Danville, Virginia, plant of Smith-Douglass Co. was presented with a citation by the company recently. The company went through the entire year of 1952 without an accident.

In recognition of the accomplishment, Vernon S. Gornto, S-D Safety Director, presented a certificate of merit to the plant's manager, Percy J. Scearce in a ceremony attended by the entire plant personnel. The manager then presented a pocket-size replica of the original certificate to each employee, emphasizing the importance of keeping safety foremost in the mind of each individual in the plant.

As an example of how the plant's safety record has improved since a definite program was adopted, it was pointed out that the accident rate for the company in 1946, was 30.5 per million man hours. Since then it has declined steadily until it now has a ratio of only 5.21 as compared to the fertilizer industry's overall rate of 29.8.

•

So. Safety Meet. in Atlanta

The Fertilizer Section of the National Safety Council will present two programs at the meeting of the Southern Safety Conference scheduled to be held at the Atlanta Biltmore Hotel, Atlanta, Ga., March 1, 2 & 3. The first of the fertilizer safety programs is scheduled for Monday afternoon, March 2, with A. B. Pettit, Davison Chemical Co., Baltimore, Md., as chairman. This will be an informal conference on fertilizer plant safety, with a panel of four participating. These will include G. F. Dietz, safety director, Fertilizer Manufacturing Cooperative, Inc., Baltimore, Md.; F. W. High, manager of operations, Baugh Chemical Co., Baltimore; C. A. Cox, assistant manager, manufacturing department, Virginia-Carolina Chemical Co., Richmond, Va.; and E. F. Carnell, superintendent, Davison Chemical Co., Savannah, Ga.

The advance program indicates that there will be no speakers, but that fertilizer plant people are requested to submit specific safety and fire protection questions, in writing, to Mr. Pettit by February 15. Questions will also be submitted from the floor, although preference will be given to written questions submitted in advance, it is stated.

On Tuesday afternoon, March 3, four talks are scheduled. These include the presentation of "The Maintenance Foreman's Responsibility", by O. R. Kiphart, safety supervisor, Phillips Chemical Co., Berger, Texas; "The Importance of Fire Protection", by Walter Zielenske, fire prevention engineer, Marsh and McLennan, Chicago, Ill.; "Housekeeping in Fertilizer Manufacturing Plants", by E. O. Burroughs, Jr., manager, insurance department, F. S. Royster Guano Co., Norfolk, Va.; and "Before and After", by A. C. Thornton, industrial relations manager, International Minerals & Chemical Corp., Chicago, Ill.

The meeting will be concluded that afternoon with a general discussion high-lighting points made in the papers given previously.

•

Systemics on ACS Program

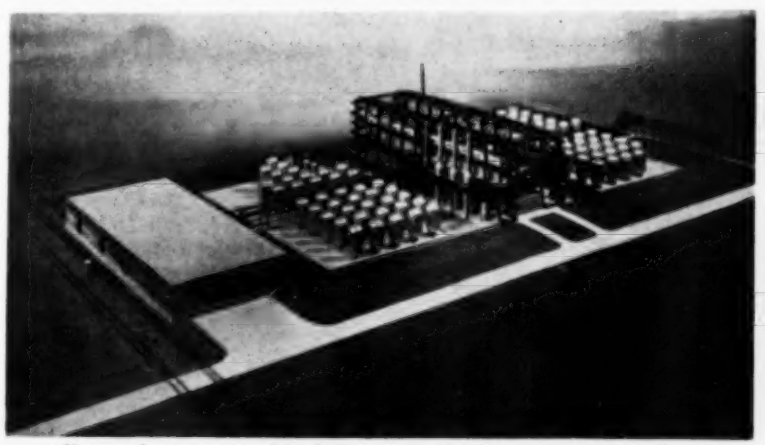
The American Chemical Society will hold its 123rd national meeting in Los Angeles, Calif., March 15-19, it has been announced. Dr. Robert L. Metcalf, University of California Experiment Station, Riverside, will preside at a symposium on systemic insecticides as part of the program sponsored by the Society's Division of Agricultural and Food Chemistry. Other symposia will discuss the problems involved in the shortage of chemists; "Federal Support of Basic Research in Chemistry" and "Recent Developments in Chemistry."

Headquarters for the event will be Hotels Statler and Biltmore, with other sessions in the Embassy Auditorium. Registration will start Sunday, March 15, with technical sessions opening Monday morning.

A highlight of the meeting will be the presentation of ten scientific awards at a general assembly Monday evening, March 16, in the Pacific Ballroom of the Statler Hotel. Excursions to chemical plants and laboratories in the Los Angeles area are scheduled as part of the over-all program. Some five thousand chemists and chemical engineers are expected to attend the meeting.

Dr. L. Reed Brantley, head of the department of chemistry in Occidental College in California, has been named general chairman of the 123rd meeting. He is an authority on the chemistry of fluorine and fluorine compounds.

C. & C. C. to Open New Allethrin Plant



Shown above is a model of the new allethrin plant now being built at Institute, West Virginia by Carbide and Carbon Chemicals Company, a Division of Union Carbide Corporation. When completed in early 1954, it will cover over four acres, and will be the largest plant producing this new insecticide, according to the company.

ACCELERATED FERTILIZER CONDITIONING

WITH TENNESSEE'S

SUL-FON-ATE AA9!

Our own fertilizer plants have been experimenting with wetting agents to reduce curing time and prevent secondary caking of mixed fertilizers. **SUL-FON-ATE AA 9** has been found to be very effective in this application and it is now being regularly used by our plants.

Tennessee's **SUL-FON-ATE AA 9** is an alkyl aryl sulfonate containing 90% active ingredient. It is a powerful wetting and penetrating agent that promotes better contact between the fertilizer components. This intimate contact reduces the time required for completion of the reaction.

UNTREATED

TREATED

These pictures show the effect of the addition of Tennessee's **SUL-FON-ATE AA 9** to one of our more troublesome formulas: Four units of nitrogen came from solution and the other two from sulphate of ammonia. Both samples were cured for 4 days and then bagged. The bags were stacked for 10 days and the above samples were taken from the bottom bags.

METHOD OF APPLICATION

Since manufacturing processes vary widely in fertilizer plants, the best method of introduction into the mixer must be determined at each plant. Our plants prefer to distribute it on the conveyor belt feeding into the mixer. In the pictures shown **SUL-FON-ATE AA 9** was added to the potash. It is not necessary to make any changes in operating procedure.

For further Information, please contact

ORGANIC CHEMICALS DIVISION

TENNESSEE TC TENNESSEE CORPORATION **CORPORATION**

617-29 GRANT BUILDING, ATLANTA, GEORGIA

Takes Sales Position

J. DONALD MOCHI

J. Donald Mochi, Brooklyn, N. Y., has been promoted to sales representative, northeastern states, for Pittsburgh Agricultural Chemical Company, the company has announced. A graduate of Middlebury College in 1951, Mr. Mochi was formerly assistant to Dr. J. B. Skaptason.

•

S.D. Weed Meeting Mar. 17

The annual meeting of the South Dakota Weed Control Conference is scheduled to be held at Pierre, S.D., March 17-19, according to an announcement by Charles J. Gilbert, Brookings, S.D., State Weed Supervisor.

•

Krilium Prices Reduced

Monsanto Chemical Co. has announced reductions in prices of its soil conditioner, "Krilium". The reductions amount to approximately 28% to 33% in the retail price, the company states. The five-pound container of "Krilium" was reduced from $6.95 to $4.95, with comparable reduction in the single-pound size.

Similar reductions were announced in the prices of the 10, 25 and 50 pound containers as well. According to Roy L. Brandenburger, general manager of the company's merchandising division, the lower prices result from production economies made possible by a large volume of sales throughout the country.

Monsanto first announced the development of "Krilium" in December, 1951, and the company's merchandising division was created in May, 1952, to handle the sale of "Krilium" and other Monsanto products nationally.

•

Elgin Gets Post at Chase

E. S. Elgin has been made sales manager of the waterproof, polyethylene and crinkled paper products department of the Specialty Division of the Chase Bag Company, R. N. Conners, vice-president has announced.

Mr. Elgin was connected with the specialty department of the Chase Philadelphia and St. Louis branches before transferring to the general sales department in Chicago early in 1952.

•

S.A. Plants Lack Power

Lack of electric power has forced the closing of Portugal's two new ammonium sulfate plants, it has been learned in the U.S. The factories at Alferrarede and Estarreja had been granted low rates for power with the understanding that the supply would be suspended when low water conditions in the country reduced electric output, according to the Ministry of Economy.

It was expected that power supplies would be resumed as soon as water levels regained their normal height, and that more power will be available during 1953.

•

S-D, San Jacinto May Merge

An agreement prior to a merger is reported to have been signed by Smith-Douglass Company, Norfolk, Va. and San Jacinto Chemical Corp., Houston, Texas, late in January. Although terms of the proposed merger had not been announced at press time, it was understood that Smith-Douglass would be the surviving firm.

Smith-Douglass manufactures and distributes fertilizer materials while San Jacinto makes anhydrous ammonia in a long-term leased government-owned plant in Texas. S-D recently acquired Coronet Phosphate Co., producer of high-grade phosphate rock; a fact which will make the former a producer of both ammonia and phosphate rock if the San Jacinto deal is consummated.

Becomes Thurston V-P

ROBERT G. SIMMS

Thurston Chemical Company, Joplin, Mo., has announced the appointment of Robert G. Simms as executive vice-president of the company. The action was taken at the January 6 meeting of the board of directors. Prior to this appointment, Mr. Simms had served as a vice-president responsible for company expansion. He is also a member of the board of directors of the company.

Joining Thurston in 1951 as assistant to the president, Mr. Simms had for 24 years prior to that, been associated with the Naco Fertilizer Company of New York City. He resigned as president, general manager and director to join Thurston Chemical Company.

Before entering business, Mr. Simms studied agriculture at the University of Illinois.

•

Korea Vet Returns to G. C.

Captain A. P. Connelley has rejoined General Chemical Corporation after a tour of duty with the U.S. Air Force in Korea. The captain completed 35 combat missions in Korea, flying B-29's.

This was his second experience in war, having served in the Pacific area during World War II, flying numerous missions in B-29's at that time.

His headquarterss will now be in Atlanta, Ga., the company having transferred him from Greenville, Mississippi where he was located before returning to war duty two years ago.

•

Fertilizer Exec. Dies

Fred Carroll, Sr., 56, head of the Farmers Fertilizer Co., and several other firms in Tallahassee, Fla., died there December 25, after a long illness.

It Resists Caking!

Nitrogen is in great demand. Even Phillips tremendous capacity isn't equal to today's requirements. But we're making four different kinds of high-quality nitrogen material for mixers and farmers.

1. AMMONIUM SULFATE . . . Phillips *66* Ammonium Sulfate contains 21% N. Flows freely, resists caking. For high-analysis mixed goods or direct application.

2. NITROGEN SOLUTIONS . . . there are three Phillips *66* Nitrogen Solutions for use in the preparation of high-analysis fertilizers and the ammoniation of super-phosphate. These solutions keep handling costs low . . . promote rapid, thorough curing.

3. ANHYDROUS AMMONIA . . . Phillips *66* Agricultural Ammonia contains 82% N. Convenient, economical source of nitrogen for fertilizers.

4. AMMONIUM NITRATE (see photograph and description above).

For full information write our nearest district office.

Phillips 66

PHILLIPS CHEMICAL COMPANY

A Subsidiary of Phillips Petroleum Company

FERTILIZER SALES DIVISION · BARTLESVILLE, OKLAHOMA

DISTRICT SALES OFFICES:

NORFOLK, VA.—610 Royster Bldg. • TAMPA, FLA.—7 Terrace Office Bldg.
HOUSTON, TEX.—604 City National Bank Bldg. • AMARILLO, TEX.—First National Bank Bldg. • OMAHA, NEB.—WOW Bldg.
PASADENA, CALIF.—604 Citizens Bank Bldg. • NEW YORK, N. Y.—80 Broadway • BARTLESVILLE, OKLA.—Adams Bldg.

Agronomy Award Presented by APFC

Potential agricultural leaders competed for a nationwide "Achievement Award," sponsored by the American Society of Agronomy in cooperation with the American Plant Food Council. The top honors, as the best Agronomy Club in the United States, were won by the Texas A&M Club, whose president, Glenn Black (center), is shown with Dr. John R. Taylor, Jr. (left), agronomist representing the Council, and Dr. Darrell S. Metcalfe, Iowa State College, chairman, student activities, American Society of Agronomy. The award was made at the Society's recent convention in Cincinnati, Ohio.

DDT Quantities Shipped

A total of 5,316 tons of 75% DDT has been purchased by the State Department and the United Nations for use in malaria control programs in tropical countries, it has been learned from trade sources. The insecticide, a special formulation for malaria control, was taken from surplus U. S. stocks, it was indicated.

The first order, from the General Service Administration on December 1, 1952, was for 110 tons. On December 12 the same group ordered 100 tons and on the 22nd, 200 tons more. The biggest single order, for 4,480 tons, was placed on January 9, 1953, with several firms participating in the deal.

Since then three more sizeable orders have been recorded. On January 13, the United Nations purchased 250 tons; and on the 21st, the General Service Administration bought 66 tons. A later purchase, also by G. S. A., was made on January 26, involving 110 tons.

It was pointed out by industry spokesmen, that these purchases are not to be confused with private deals made for the exporting of DDT and other insecticides. Figures on the latter were described as "impossible" to get without a strong likelihood of duplication.

The price of the export grade 75% DDT reached its low point last October when a bid was accepted at a figure of approximately 23¾¢ lb. Since then, quotations have moved upward. The first bid referred to above went at a little over 25½¢, while on the large 4,480 ton order a portion of this went at 30¢, with some bids as high as 35¢.

The price curve on technical DDT lagged behind the export grade. Technical did not reach its low point of 23¢ until late December, but there has been some strengthening of the market since this low point was reached, with most producers now quoting above this level.

•

Geigy Names McLaurin

J. Franklin McLaurin, president of National Ginners Association, has joined the Insecticide Division of Geigy Company Inc. The Company announces that Mr. McLaurin will maintain liaison on a nation-wide basis with other personnel concerned in the sale of cotton and tobacco formulations.

Regarded as one of the country's leading figures in cotton and tobacco both as a grower and business man, Mr. McLaurin has engaged in many activities in these fields.

Briefly, he is chairman of the South Carolina State unit of the National Cotton Council, past president of the Carolina Ginners Association for two terms, director of the Marlborough County Farm Bureau as well as president of the National Ginners Association.

Mr. McLaurin is a resident of Bennetsville and graduated from Clemson College in 1922.

Geigy also announces that R. H. Hodgson has been made assistant southeast regional manager of the Insecticide division. Mr. Hodgson served as state sales manager in Georgia during 1952.

Before coming to Geigy, he was for 12 years associated with the field of agricultural chemicals as salesman in the southeast for Union Bag and Paper Corp.

He was graduated from the University of Georgia in 1935 and held the rank of colonel in World War II in the 7th Armored Division.

•

Salesmen Name Milano

Robert J. Milano, president of the Millmaster Chemical Corporation, New York, and of the Berkeley Chemical Corporation, Berkeley Heights, N. J., was elected president of the Salesmen's Association of the American Chemical Industry, at a meeting held in the Hotel Roosevelt, New York, January 21. Mr. Milano succeeds Edward A. Bush of Bush Aromatics Division of the Dow Chemical Company, Midland, Mich.

Other officers elected were Warren F. Schumacher, J. T. Baker Chemical Company, Phillipsburg, N. J., vice- president; John F. Henry, Adams-Henry Chemical Company, New York, treasurer; and Edward L. Collins, Chilean Nitrate Sales Corporation, New York, secretary.

For economy . . .
For better field performance of agricultural emulsions use

TRITON X-150

TRITON X-160

Individually or in combination, these new TRITON emulsifiers provide important advantages to both formulators and growers.

FORMULATORS will be interested in these important properties:

Versatility in emulsifying a wide variety of toxicant-solvent systems; thus emulsifier inventory can be kept to a minimum.

Effectiveness at low concentrations; therefore, finished formulations are more economical.

GROWERS will appreciate these advantages in the field performance of concentrates formulated with TRITON X-150 and TRITON X-160:

Excellent spontaneity

Stability of emulsions with waters of varying hardness.

Write for samples and for technical bulletin AG-13. This bulletin gives more detailed information on the application of TRITON X-150 and TRITON X-160.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

* TRITON *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries*

Elected to the board of directors for two-year terms were Ralph L. Ericsson, Sumner Chemical Company, Zeeland, Mich.; LeRoy P. London, E. I. duPont de Nemours & Co., Wilmington, Del.; George E. Kuehn, Carbide & Carbon Chemicals Division of Union Carbide & Carbon Corporation, New York; Harry P. Smith, Mathieson Chemical Corporation, Baltimore, Md., and Walter T. Johnson, Columbia - Southern Chemical Division of Pittsburgh Plate Glass Company. Elected for one year was Vincent L. Rebak, recently resigned from Heyden Chemical Corporation, New York.

•

Fertilizer by Monsanto

A water-soluble fertilizer, formulated to minimize risk of leaf or grass burn, has been developed by Monsanto Chemical Company, St. Louis, Mo., according to Roy L. Brandenburger, general manager of the company's Merchandising Division.

The new product, called "Folium," is now being manufactured and will be offered to the public shortly through distributors and dealers currently handling products of Monsanto's Merchandising Division.

Products previously offered by Monsanto through national retail channels include "Krilium" soil conditioner.

"Folium" is a quickly-soluble inorganic 20-20-20 fertilizer, containing a chemical which keeps the product in free-flowing, non-caking condition and is said to assist in the absorption of nutrients by the plant leaves.

Tests with radioactive tracers have shown that the plant food available in water-soluble fertilizers is absorbed by plant leaves within 30 minutes to two hours after the fertilizer is applied.

In the home garden field the new fertilizer may be sprayed or sprinkled on grass, flowers, vegetables, shrubs and trees by use of a garden hose coupled with a siphoning device. It also may be used with any one of several commercially available spray applicators or an ordinary sprinkling can.

Additionally, "Folium" is expected to have wide usage in greenhouse and nursery operations because of the increased efficiency and economy of water-soluble fertilizers in these fields.

•

Soil Improvement Meeting

Plans for the joint meeting of the Midwest Soil Improvement Committee with industry, are complete, acording to Z. H. Beers, head of the M.S.I.C., Chicago. The meeting will be held February 20 at the Palmer House, Chicago.

Agronomists and soil scientists from Federal and State agencies, Land Grant Colleges and the industry, totaling more than 300 persons from 13 midwestern states are expected to attend the event, Mr. Beers says.

•

Ala. Pesticide Short Course

February 24 and 25 are the dates set for the fourth annual Alabama pesticide short course to be held at Alabama Polytechnic Institute, Auburn, Ala. According to Dr. E. V. Smith, dean and director of the Alabama Agricultural Experiment Station, Auburn, the meeting will be attended by county agents, dealers, distributors, blenders and formulators of agricultural chemicals. Custom operators from the area are expected to be in attendance, also.

According to Dr. R. L. Hanna, chairman of the program committee, speakers at the two-day sessions will include Dr. Charles E. Palm, president of the new Entomological Society of America; Dr. E. Gorton Linsley, retiring president, E.S.A.; Dr. H. G. Johnston; and Dr. E. W. Laake, who since his retirement from the Bureau of Entomology and Plant Quarantine, has been with the Office of Foreign Agricultural Relations in South and Central America.

An informal shore dinner is planned for the evening before the meeting proper begins, A. J. Garon, chairman of the local arrangements committee states.

Mathieson Chemical Donor of Awards

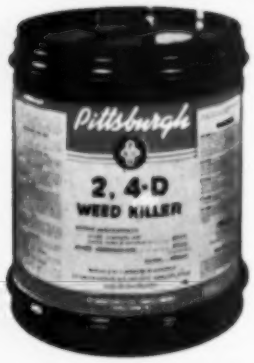
Mathieson Chemical Corp., Baltimore, Md. will donate awards in 1953 to former 4-H Club members who have become leading citizens in various communities, according to G. L. Noble, director of the National Committee on Boys and Girls Club Work.

S. L. Nevins, president of Mathieson Agricultural Chemicals Co., a division of the donor company has indicated that two awards will be provided at the county level in all participating states; four state awarrs and eight persons will be named for national honors. In commenting on the awards, Mr. Nevins pointed out that "Recognition of former 4-H boys and girls who have made notable contributions should be an inspiration to farm youth of today."

In the photo above, are Mr. Noble, left, and Mr. Nevins, checking over the award plans.

Your customers
could control weeds
like this . . .

but for fast, positive control, sell them



Pittsburgh 2, 4-D

You can increase your sales and profits and build up a greater list of satisfied customers by recommending *Pittsburgh* 2,4-D. This powerful chemical weed killer is economical and easy to use, and, in the low volatile ester formulation—*Pittsburgh* D4—the chances of damage to nearby crops is reduced to a minimum. *Pittsburgh* 2,4-D provides more uniform and dependable weed killing results because it's *Quality-Controlled* at every step of production—from coal to finished chemical. That's your best possible assurance of consistent peak quality and continuing, dependable supplies. Sales and technical information is yours for the asking.

PITTSBURGH AGRICULTURAL CHEMICAL COMPANY

EMPIRE STATE BUILDING, NEW YORK 1, NEW YORK

W&D 4468

Standard for Quality

ORGANIC INSECTICIDES: Benzene Hexachloride, Toxaphene, Dichloro Diphenyl Trichloroethane, Aldrin, Dieldrin, Chlordane.

ORGANIC PHOSPHATE INSECTICIDES: Parathion Wettable Powders, Parathion Liquid Concentrate, Metacide, Systox.

WEED KILLERS: 2,4-D Acid, 2,4-D Amine Concentrates, 2,4-D Ester Formulated Concentrates, 2,4-D Sodium Salt Monohydrate, D4 (Low Volatile 2,4-D Ester), 2,4,5-T Formulations.

FUNGICIDES, SEED DISINFECTANTS, COTTON SPRAYS AND DUSTS, AND OTHER SPECIAL AGRICULTURAL CHEMICALS.

A DIVISION OF
PITTSBURGH
COKE & CHEMICAL CO.
Grant Building - Pittsburgh 19, Pa.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Forms New Ammonia Dept.

Formation of the EconoGas division of Blish, Mize and Silliman Hardware Co., Atchison, Kansas, has been announced. The new division will be the firm's agricultural ammonia department, headed by Frank Johnson.

Five high pressure tanks, with a capacity of 30,000 gallons each, are being installed on company property, along with five smaller tanks with a combined capacity of 300,000 gallons for storage of anhydrous ammonia, stored as a liquid under pressure.

The ammonia, which is 83 per cent nitrogen, is applied to the soil with a special applicator that injects the liquid into the ground at a depth of four to six inches where it becomes a gas. The nitrogen content should help some land produce 25 additional bushels of wheat per acre, according to the company.

Blish, Mize & Silliman Hardware Co. was one of the pioneers in the propane gas business, and maintains propane storage on the same site.

•

Two Monsanto Patents

Two United States patents pertaining to synthetic organic chemical soil conditioners have been issued to Monsanto Chemical Company, the firm has disclosed.

The first of these, U. S. Patent No. 2,625,529, pertains to the use of a large and diversified class of synthetic organic polyelectrolytes as soil conditioners, including Monsanto's Krilium soil conditioners.

The other patent, U. S. No. 2,625,471, pertains to plant fertilizing compositions containing plant nutrients and certain synthetic organic polyelectrolytes.

•

Prindeville to Swift Board

C. T. Prindeville, vice-president, Swift & Co., Chicago, was made a director of the company at the firm's annual meeting January 15. The new director has been with Swift since 1921, starting his career as a cattle driver. He advanced through a number of positions until in 1941, he was named a vice-president. At present he is in charge of plant food operations as well as those of oil mill, livestock and poultry feed.

During World War I, Mr.

C. T. PRINDEVILLE

Prindeville served as an officer in France with the 307th Field Artillery. He was re-called for service by the War Department in 1942. He was transferred to the War Production board and placed in charge of edible fats and oils, and later became chief of the fats and oils branch of the War Food Administration.

•

Named to Bagpak Post

Appointment of R. R. Worthington as assistant sales manager, Bagpak Division, International Paper Company, was announced recently by R. I. LaMarche, sales manager. O. W. McDuffie will take Mr. Worthington's place as sales manager of the Machinery Sales and Service Department of the Bagpak Division.

Mr. Worthington joined Bagpak, Incorporated, (which later became the Bagpak Division of International Paper) as assistant chemist in the research and development laboratory in Philadelphia, in 1934. When the laboratory was moved to Camden, Arkansas in 1935, he was placed in charge. He subsequently transferred to the sales department and was in charge of midwest sales in 1941 when he left the company on military leave of absence. On his return in 1946 he was placed in charge of Machinery Sales and Service.

Mr. McDuffie, who becomes Sales Manager of Machinery Sales and Service, comes to New York from Kansas City, where he was in charge of the Bagpak sales office.

•

Stevens New Chase S. M.

Robert J. Stevens has been appointed sales manager of the Multiwall Division of the Chase Bag Company, R. N. Conners, vice-president, has announced.

Mr. Stevens has been associated with the Chase Organization since 1945. Prior to his transfer to the general sales department in Chicago in November of 1950, he was sales manager of the Buffalo-New York branch.

G. N. Burns, formerly in the Chicago general sales office, has been transferred to New Orleans as regional sales manager of the Multiwall Division.

•

On College Lecture Panel

George N. Burns, sales manager of the Paper Bag Division of the Chase Bag Company, recently addressed the senior class of the Western Michigan College at Kalamazoo.

His subject was "Multiwall Bags, Construction and Uses." Following his talk before the college seniors, Mr. Burns spoke on the same subject before an evening session attended by executives of the papermaking industries in the Kalamazoo section.

This series of lectures of which Mr. Burns' speech was a part is conducted by the Advisory Committee on Paper and Pulp Technology. The lectures given in connection with the course are to form the basis for the official textbook to be used in the courses on Pulp and Paper Technology of the Western Michigan College.

•

Canners Discuss Insects

A symposium on "The Race Between Pests and Pesticides" is scheduled as part of the 46th annual convention of the National Canners Association to be held at the Conrad Hilton (Stevens) Hotel, Chicago, February 20-24.

The section of Quality Pro-

DILUEX-A in the quantities indicated was used by one processor during a single year. Difficulties in production or in the procurement of raw materials were reduced to a minimum. An enlarged output of high-quality finished product, and approval of the company's many customers were the result.

DILUEX-A, produced by the Floridin Company at Quincy and Jamieson, Florida, is one of the most adaptable carriers for agricultural chemical processing. Developed with the plant operator's problems in view, it meets the most exacting requirements in liquid toxicant formulation, and is winning general acceptance throughout the industry. Availability of supplies, fully effective plant capacity, and assurance of a quality product are three advantages that the user of DILUEX-A enjoys.

Special processing makes DILUEX-A applicable to many and varied uses. Do not endure interruptions or slow-downs that a Floridin product might avoid. Correspondence is invited.

FLORIDIN COMPANY

Adsorbents . . . Desiccants . . . Diluents

Dept. M, 120 Liberty St., Warren, Pa.

tection and Food Regulation will be held on Sunday, February 22 at 10 a.m., the advance program indicates. Charles H. Mahoney, director, Raw Products Research Bureau, National Canners Association, will preside at this session. Dr. Fred C. Bishopp, assistant chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington, D. C. will be leader of the panel on "The Race Between Pests and Pesticides."

A second panel on "The Effect of Applied Chemicals on the Flavor of Canned Foods" will be under the leadership of Ray C. Wakefield, chairman, Baby Foods Committee of the National Canners Association. Panel members in both cases are to be announced later.

Sunday afternoon will see another panel discussion on "The Drosophila Fruit Fly Problem." Panel members will include J. J. Wilson, Tomato Products Sanitation Committee, National Canners Association, chairman; Dr. Bailey B. Pepper, New Jersey Agricultural Experiment Station, New Brunswick, N. J.; H. R. Smith, Washington Research Bureau, N.C.A.; and Ira I. Somers, Western Branch Laboratory, N.C.A.

•

NBBB Conditioner Report

The National Better Business Bureau has just released an "Interim Report on Chemical Soil Conditioners," as a guide in the preparation of accurate advertising of these new synthetic resins.

The new report tells what chemical soil conditioners probably can and cannot do, discusses the merits of various claims, the possibilities in further experimentation. According to the NBBB study, these new synthetic resins act on clay particles to bind them into water stable aggregates, or lumps, thus increasing the workability of problem soils.

Soil conditioners, as such, have no fertilizing value but they fix soil structure, making it possible to use fertilizers more advantageously. Firms which combine a fertilizer with a soil conditioner may advertise the benefits of both soil structure improvement and rapid growth of plants, if the fertilizer is present in adequate amounts. Preparation of the soil for optimum results in important but conditioners may be sprinkled on non-problem soil in certain cases, the report states.

The products, according to NBBB's study, have definite limitations and there is much about them that remains unknown or unproved. The bulletin, recommending caution throughout, concludes on this note:

"In view of the many variables in the conditions of use of these chemical soil stabilizing agents, or 'conditioners' as they are commonly called, and in view of the limited use experience with such products and the still unknown factors concerning them, NBBB believes that advertising claims for chemical soil conditioners should be confined to the provable facts concerning them. NBBB further believes that in the public interest, advertisers should have such proof in hand before such claims are set forth in advertising."

•

Cotton Branch, AAEE, Meets

February 9-11 were the dates set for the annual meeting of the Cotton States Branch, American Association of Economic Entomologists, scheduled to be held at the Jung Hotel, New Orleans, La. The meeting was to be held jointly with the Louisiana Entomological Association.

According to the program published a short time ahead of the meeting, the program included talks by Dr. Kirby L. Cockerham, Louisiana Extension Service, chairman of the Cotton States Branch; and Dr. Charles E. Palm, head, Department of Entomology, Cornell University, Ithaca, N. Y., president of the Entomological Society of America.

Others scheduled to appear on the program included E. H. Floyd and C. E. Smith, Louisiana Agricultural Experiment Station, Baton Rouge; Walter M. Kulash, North Carolina State College, Raleigh; Clay Lyle, Mississippi State College; C. C. Francher, F. J. Bartlett; Hiram C. Young and H. S. Hollingsworth, Florala, Alabama; Kelvin Dorward, U.S.D.A., Washington, D. C.; M. D. Farrar, South Carolina Agricultural Experiment Station, Clemson, S. C.; F. S. Arant and James A. Griffin, Alabama Agricultural Experiment Station, Auburn; and E. W. Dunnam, Mississippi State College.

•

Named to NAC Post

JOHN J. LYNCH

John J. Lynch was recently appointed by A. W. Mohr, president, National Agricultural Chemicals Association, as the new chairman of the NAC transportation committee. Mr. Lynch has served as a member of this committee for the past ten years. He is general traffic manager of Niagara Chemical Division of Food Machinery and Chemical Corporation, supervising all phases of traffic and transportation operations of Niagara at their several plants in the United States as well as Canada and Mexico. He is completing his 29th year of service with Niagara.

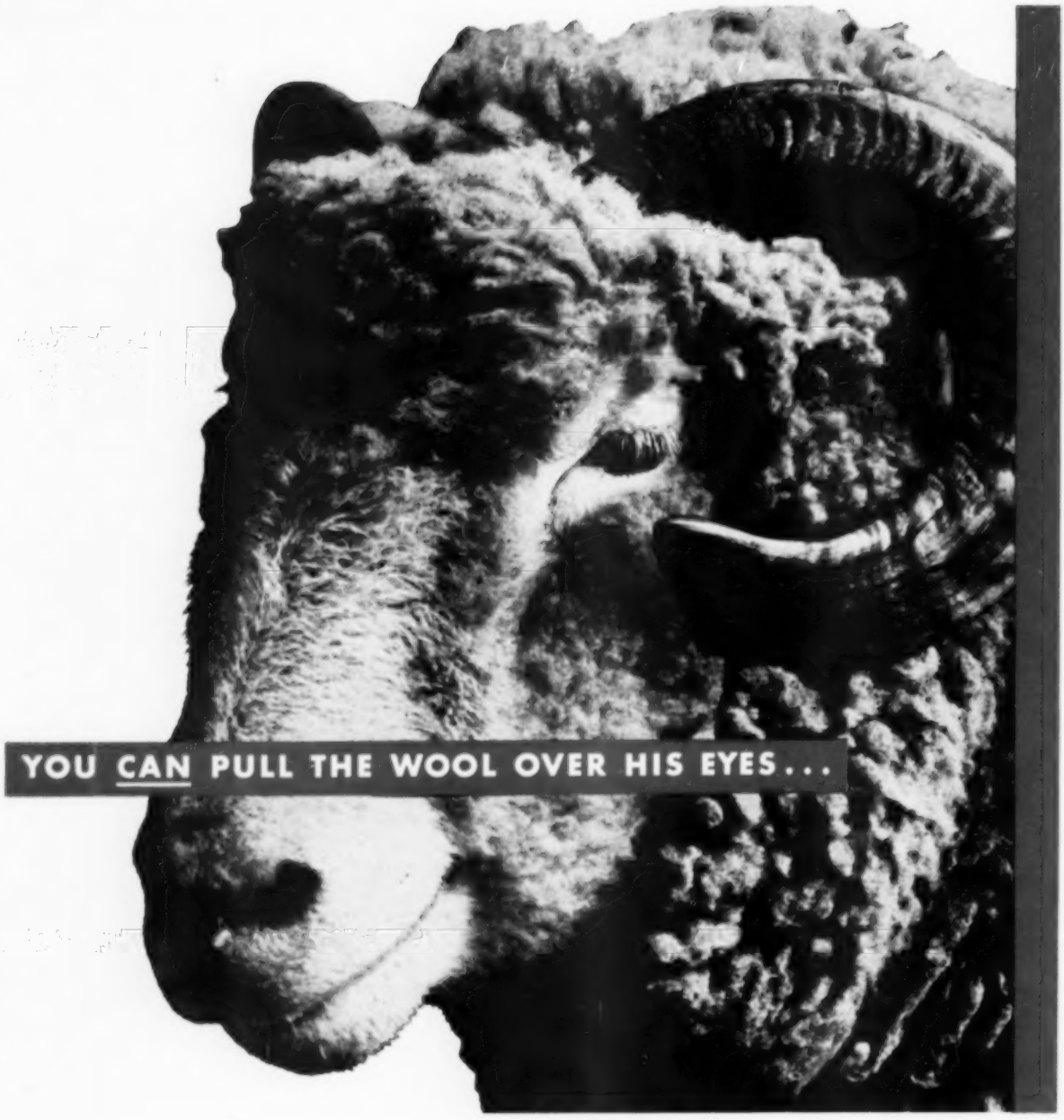
•

Leaves Mich. Chem. Post

In order to devote more of his time to United States Radiator Corporation and his other interests, Roland P. Place resigned as president of Michigan Chemical Corporation at a meeting of the board of directors on January 17.

Mr. Place is chairman of the board and member of the executive committee of United States Radiator Corporation. He is also a director of the Midland National Bank of Midland, Michigan, and he continues as a member of the board and as a substantial stockholder in Michigan Chemical Corporation.

Donald D. MacFarlane, chairman of the board of Michigan Chemical, has also been assigned the duties of president, and John L. Giles continues as V-P and general manager.



When the fleece on the flock is long and heavy the rancher knows that his efforts will pay off in profits. Prime stock is fed prime feed to assure good meat, good wool—good prices.

While man supplies labor and knowledge, it's the soil that supplies the strength responsible for the growth of all living things. For from the soil come the vital plant-food elements that nourish all life. And to the soil these elements must be returned.

Many of the most effective soil-replenishing fertilizers contain POTASH, often Sunshine State Potash, a product of New Mexico. For Potash helps nourish the soil with active ingredients that make for bumper crops and healthy flocks. In every way Potash proves a valuable profit-producing aid to a healthy state of business.

SUNSHINE STATE POTASH
PRODUCT OF NEW MEXICO U.S.A.

REG. U. S. PAT. OFF.

HIGRADE MURIATE OF POTASH 62/63% K_2O
GRANULAR MURIATE OF POTASH 48/52% K_2O
MANURE SALTS 20% K_2O MIN.

UNITED STATES POTASH COMPANY, Incorporated, 30 Rockefeller Plaza, New York 20, N. Y.

Illinois Custom Operator School Held

SOME nearly 400 custom spray and dust operators talked over mutual problems and heard from agricultural chemical experts in the fifth annual Spray Operators' Training School held January 15 and 16 at the University of Illinois, Urbana. In addition to representatives from nearly all of the state's 102 counties, nine other states and the Dominion of Canada were also represented on the registration list, according to H. B. Petty, extension entomologist of the Illinois Natural History Survey, in charge of the School.

Joseph Garland, Dixon, Illinois, was elected president of the State Agricultural Spraying Association, and other officers were named as follows: Ralph Blair, Fisher, Ill., vice-president; and A. E. Pickard, Mt. Vernon, Ill., secretary-treasurer. The Illinois Association of Aerial Applicators elected Robert Ueding, Vincennes, Ind., as president; Earl Taynor, Champaign, Ill., vice-president and William Deaton, Marion, Ill., secretary-treasurer. Both organizations, incidentally, voted to accept associate memberships of persons interested in the conduct of the spraying services.

In addition to discussions by the custom operators themselves, weed control experts, agronomists, plant pathologists and entomologists were on the program to answer questions and to brief the operators on efficient methods of pest control, best materials to employ and techniques involved. They were also given a picture of the over all need for pesticide application.

Earle S. Raun, Iowa State College, Ames, described livestock pest control in Iowa, stating that in these days of high feed costs, high labor costs and small margins on the feeding of livestock, farmers are interested in controlling all factors which reduce their profits. Among these factors, he said, are external parasites of livestock which cost farmers millions of dollars each year. These losses are preventable.

Getting down to specific cases, Mr. Raun said that annual loss from cattle grubs cost Iowa farmers about $6,000,000; cattle lice, a million dollars; cattle mange, $104,000; hog mange, $4,500,000; hog lice, $4 million; sheep ticks, $900,000; sheep scab, $124,000, for a total of $16,628,000.

Mr. Raun declared that situations like these present an opportunity for the custom operator, but in

In the Photos

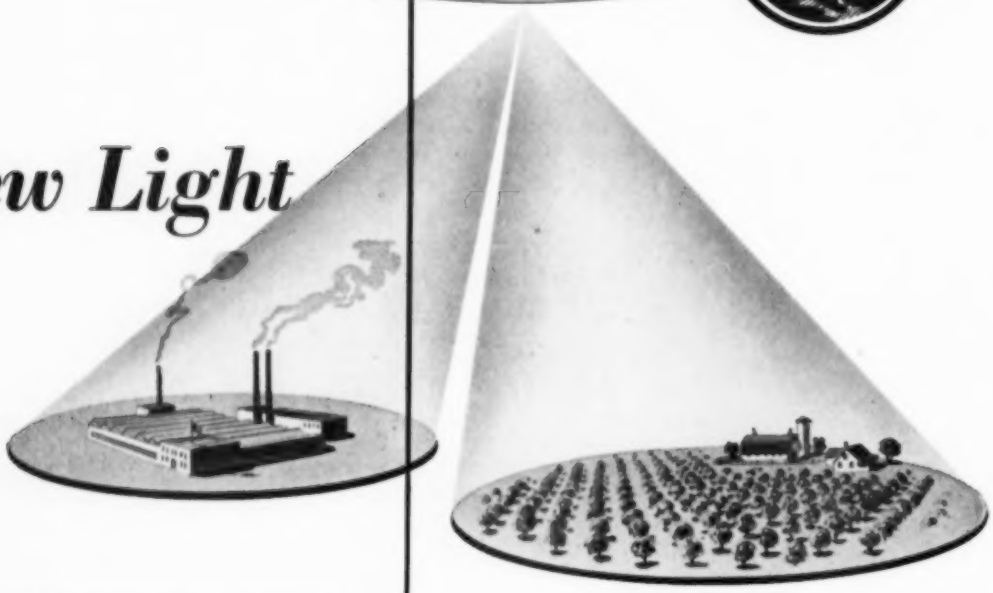
Below (top picture) Dr. George C. Decker, Illinois Natural History Survey entomologist, congratulates Joseph Garland, Dixon, Ill., re-elected president of the Illinois Ground Sprayers Association. With them are A. E. Pickard, secretary-treasurer of the Association and Ralph Blair, vice-president.

Lower photo: H. B. Petty, Illinois Natural History Survey, offers congratulations to R. H. Ueding, Lawrenceville, Ill., newly-elected president of the Illinois Association of Aerial Applicators. With them are William Deaton, secretary-treasurer of the group and Earl Taynor, vice-president.

TRONA
INDUSTRIAL AND AGRICULTURAL CHEMICALS

ESTON CHEMICALS

New Light



TRONA-ESTON CHEMICALS INCLUDE:

TRONA† BRAND
Lithium Chemicals
Muriate of Potash (agricultural & chemical grades)
Potassium Pentaborate
Salt Cake
Soda Ash
Sodium Pentaborate
Sulphate of Potash (agricultural grade)

THREE ELEPHANT BRAND*
Borax, Technical (coarse and fine granular-powdered)
Boric Acid (Technical and U.S.P.)
PYROBOR* Dehydrated Borax, Technical (coarse & fine granular)
TRONABOR* Pentahydrate Borax (agricultural & refined grades)

ESTON BRAND
ALKRON* (parathion formulations)
BROMOFUME* (soil fumigants)
ESTOMITE* (residual type miticide)
ESTONATE* (DDT dust concentrates and emulsifiable solutions)
ESTONOX* (toxaphene formulations)
Organic bromides
TETRON* (Tetraethyl pyrophosphate formulations)
TUMBLEAF†
TUMBLE-WEED†

*Trade Mark Registered
†Trade Mark American Potash & Chemical Corp.

TRONA
INDUSTRIAL AND AGRICULTURAL CHEMICALS

ESTON CHEMICALS

ON OLD SUBJECTS...

Agriculture and industry are as old as written history. Old subjects it is true, but through the years chemistry has altered established formulas and radically changed the accepted methods of both.

American Potash and Chemical Corporation recognizes that nothing is constant but change. Since its earliest beginnings in 1862 this Company has always endeavored to move forward in research methods and facilities. It has steadily added to its line of basic raw materials for the chemical processing field. In its recent acquisition of the Eston Chemicals, Inc., it is following its staunch policy of expanding facilities and services to meet requirements of present and future customers.

PROVED CHEMICALS FOR INDUSTRY AND AGRICULTURE

American Potash & Chemical Corporation

Offices 3030 West Sixth Street, Los Angeles 54, California
122 East 42nd Street, New York 17, N. Y.

ESTON CHEMICALS DIVISION
3100 East 26th Street, Los Angeles 23, California

Plants Trona and Los Angeles, California

order to get the business, it is necessary to advertise, to conduct "result demonstrations" and show skeptical livestock owners that it is possible to control expensive insect pests.

He suggested that the custom operator line up a few progressive farmers located strategically through the local area and through the cooperation of the county agent, work out a set of demonstration meetings at which other farmers whose livestock is infested, can see at first hand the methods of control. Thus they are likely to be convinced that this will be of value in their cases, too. The cattle being sprayed as part of the demonstration should be treated either on a no-cost or a cost-of-materials basis. "The best advertising . . . is by word of mouth from a farmer whose livestock are pest free . . . " the speaker declared.

About 600 custom operators are working in Iowa, it was reported, and they charge from 15¢ to 25¢ per head over the cost of the insecticides. The prospect was pictured as a year-round opportunity, with winter treatment for cattle grubs, cattle lice, cattle mange, hog lice and hog mange. The spring brings opportunity for control of sheep tick and fly control and the summer season is of course promising for all types of insect control.

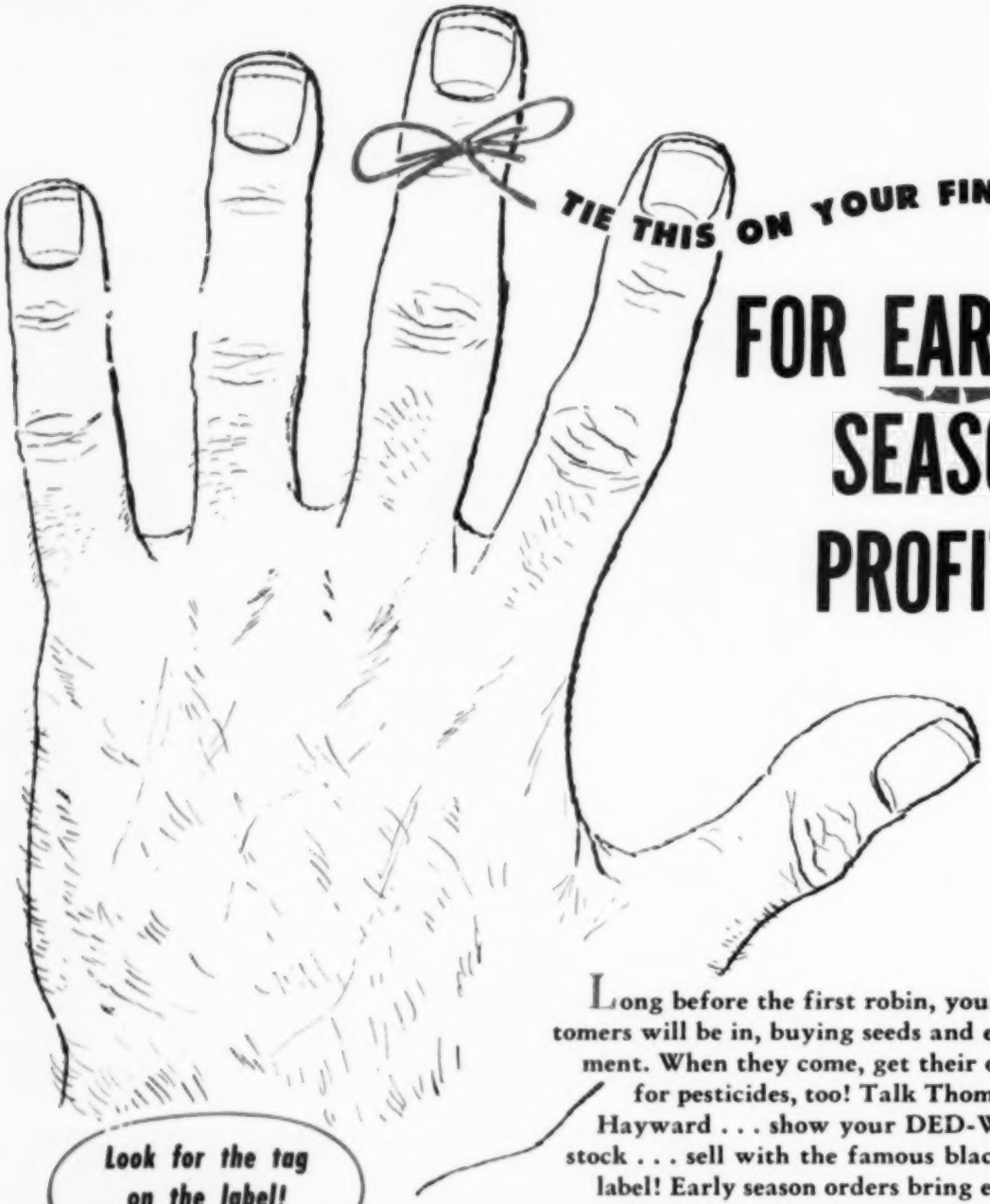
Following along the line of agricultural fly control, H. B. Petty told the group that although the long-time effect of fly control has reduced populations considerably, still, the flies are building up to former abundance and there will be more demand for fly control since people have experienced the advantages of having

In the Photos

Top picture, (L to R): Allen Blair, Foosland, Ill.; R. O. Hall and R. C. Weber, both of St. Charles, Ill.; Ralph E. Clutts, Sibley, Ill. and William G. Cox, Franklin, Ill., discussing methods of applying liquid fertilizer to the soil.

Middle photo: (L to R): Charles Knote, Cape Girardeau, Missouri; J. L. Carter, director of the U. S. Regional Soybean Laboratory, Urbana, Ill.; Vernon Anderson, Newark, Ill.; and Joseph Garland, Dixon, Ill., president, Illinois Ground Sprayers Association.

Lower photo: (L to R): Earl Davies, Gardner, Ill.; Wesley Cooper, Morrison, Ill.; Mr. Petty; Earle Raun, entomologist, Iowa State College, Ames, Iowa; and Mrs. G. C. Galeener, St. Jacob, Ill. Dr. Raun addressed the school on control of livestock pests.



TIE THIS ON YOUR FINGER

FOR EARLY SEASON PROFITS

Long before the first robin, your customers will be in, buying seeds and equipment. When they come, get their orders for pesticides, too! Talk Thompson-Hayward . . . show your DED-WEED stock . . . sell with the famous black tag label! Early season orders bring earlier profits! Tie a string on your finger now!

Look for the tag on the label!

FARM-TESTED CHEMICALS

THOMPSON-HAYWARD

THOMPSON-HAYWARD CHEMICAL COMPANY

KANSAS CITY • NEW ORLEANS • DENVER • OMAHA • CHICAGO • MEMPHIS
DAVENPORT • WICHITA • DALLAS • HOUSTON • ST. LOUIS • DES MOINES • SAN ANTONIO
N. LITTLE ROCK • OKLAHOMA CITY • MINNEAPOLIS • TULSA • LUBBOCK

fewer numbers of the pest in barns and other farm buildings.

At present, however, the control situation is critical since DDT and methoxychlor have lost much of their effectiveness against resistant house flies in Illinois. "At present," he reported, "Perhaps 10% to 20% of our farms are populated with flies having moderate resistance to lindane. Resistance to insecticides developed for several seasons, but excessive fly populations tended to speed up the development of resistance. Areas infested with maggots contaminated with the insecticide also developed resistant flies rapidly."

Although 1953 may see resistance outweigh its potency, lindane was recommended by Mr. Petty, for use in dairy barns. About ¼ oz. of actual lindane per 1000 square feet was recommended. Activated pyrethrum sprays are again coming into use for fly control as a daily space spray, he said, and "Dilan" was reported as having possibilities for commercial fly control in areas other than in dairy barns.

Brush Control Described

USE of "Ammate", 2,4-D and 2,-4,5-T for brush control was discussed by R. H. Beatty, American Chemical Paint Co., Ambler, Pa., before the custom operators. These chemicals, used extensively to control woody plants on right-of-ways, pastures and roadsides and to control woody plants in forests and other areas, have become effective tools in the hands of custom operators, he said.

For use on foliage, he recommended 3 to 4 pounds of the phenoxy acids in 100 gallons of water or in low-volume oil-water mixtures for airplane spraying. Ammate is used at ¾ lb. to one lb. per gallon for ground spraying.

Recommendations for foliage sprays using brush killers, are 3 quarts to one gallon (3 to 4 pounds acid equivalent) in 100 gallons of water. With the new "ACP Brush Killer 977", 1½ gallons (3 pounds acid equivalent) in 10 gallons of diesel oil, plus 90 gallons of water has given the best control. Use 2,4,5-T at the rate of 3 quarts (3 pounds acid equivalent) per 100 gallons of water, he suggested.

When it comes to stump treatment, 2,4-D, 2,4,5-T or "Ammate" are "quite effective", Mr. Beatty said. Combinations of 2,4-D and 2,4,5-T are used at one to two percent acid weight in oil and applied in sufficient volume to run to the ground line. Brush killers and 2,4,5-T as a stump treatment should be used at one gallon (4 pounds acid equivalent) in 50 gallons of diesel oil. If resistant species are present, it may be better to use one gallon in 25 gallons of oil, it was suggested. "Ammate" is effective if applied to stump tops at the rate of one tablespoon of the crystals per 2 inches of stump diameter.

Mr. Beatty described the basal method as being the most effective with the phenoxy acids. This technique can be used at any time of the year, although the closer bud swelling is approached, the more effective the method becomes. The two most important points in using the basal spray are the location and volume of the material. The material must be directed to the base of the plant in sufficient volume to run to the ground line. Those plants sprouting from lateral rhizomes will need repeat applications.

In basal spraying, brush killers and 2,4,5-T are used at one gallon (4 pounds acid equivalent) in 50 gallons of oil. If resistant species are present, use one gallon in 25 gallons of oil. Some people use 1 gallon in 12 gallons of oil but reduce the volume to compensate for the increased concentration. Lower concentration but thorough coverage is more satisfactory, however.

In conclusion, he said, "the species of plants must be known as well as the chemical to which these plants are most susceptible. In using the phenoxy acids along road-sides we must be careful of drift to susceptible crops. We must also be considerate of garden clubs and highway commissions and not leave tall dead brush along the highways. The chemicals we have today are effective on most woody plants, but the most important man in the program is the applicator."

Prospects for an abundance of chinch bugs appear likely for central Illinois, according to J. H. Bigger, Illinois Natural History Survey entomologist, who addressed the group. From 12 to 15 counties will probably be infested, he said, and strong winds at the time of spring migration could enlarge the area. As to methods of control, barriers of creosote or "D-N" dust can prevent migrations of the immature bugs from small grain to corn. Also, parathion at 0.25 pound per acre, lindane at 0.25 pound, aldrin at 0.5 pound, endrin at .015 pound, chlordane at 1 to 1.5 pounds and dieldrin at 0.5 pound have been shown to kill all or most of the bugs upon contact when the spray is applied, he said. Only dieldrin, however, has been shown to have the necessary residual effect, having held moderate migrations from 10 to 14 days. In cases of heavy migration, two treatments will probably be required, it was pointed out.

Grasshoppers are not expected to be a major factor in pest control in 1953, Mr. Bigger declared, but scattered populations may be on hand in various parts of the state.

European corn borer numbers increased in the northern part of the state in 1952, it was reported, and with favorable conditions, some spraying may be required in this area.

Custom spraying corn for weed control was described by Dana Stewart, custom operator of Princeville, Ill., who reported on progress in this field since he began these operations in 1948. Two significant changes have been made by Mr. Stewart in the past four years, he said. One was a shift from use of the amine to ester form of 2,4-D; and the other was to apply the herbicide when corn is between 2 inches and 8 inches in height instead of when it is knee-high.

Advantages of the first switch, from amine to ester forms of 2,4-D, made possible these results: lower cost per acre; more effective kill of jimson, velvet and wild sweet potato; quicker action; result is not affected by a light rain or rain coming soon after

Dusting an apple orchard with Kolodust using a powerful new Niagara Liqui-Duster

KOLODUST IN THE RAIN

YOUR MOST EFFECTIVE WEAPON AGAINST SCAB

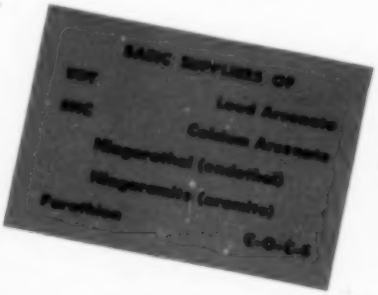
Wherever scab is a problem you will find that better growers base their control program on *dusting in the rain* with Kolodust. They hit hard when scab spores are shooting and time the applications for maximum effectiveness.

Kolodust is the only material that penetrates rain drops and adheres to foliage, buds or fruit both during and after the storm.

With a powerful Niagara Orchard Duster you can Kolodust up to 50 acres of mature apple trees in half a day. And you can Kolodust when ground conditions keep sprayers in the barn. Such timeliness in application assures maximum kill of scab spores—has saved many a crop.

Kolodust is non-caustic, safe to use. Hence, it permits foliage to develop normally. With Kolodust you will benefit from larger leaves, a smoother finish to your fruit and more fruit buds for next year's crop.

Resolve now to *Kolodust in the rain* from dormant right through each scab period. You'll turn "the fruit of your labors" into a highly profitable pack.



Niagara INSECTICIDES, FUNGICIDES, ORCHARD DUSTERS

Niagara Chemical Division

FOOD MACHINERY AND CHEMICAL CORPORATION

Middleport, N.Y. Richmond, Calif., Jacksonville, Fla., Tampa, Fla., Pompano, Fla., New Orleans, La., Ayer, Mass., Greenville, Miss., Harlingen, Tex., Pecos, Tex., Yakima, Wash., **Subsidiary,** Pine Bluff Chemical Co., Pine Bluff, Ark., **Canadian Associate:** NIAGARA BRAND SPRAY CO., LTD., Burlington, Ontario.

WHEN YOU BUY Niagara YOU BUY PROTECTION fmc Trade Mark

application; and corn does not become as brittle after ester use.

By treating the corn while it is still small, it is possible to attain easier, more rapid application, it was pointed out. Also, heavier dosages may be used if necessary; and the first cultivation is eliminated. Hard-to-kill weeds such as jimson and velvet can be controlled relatively easily when small, and the earlier spraying lends itself to this advantage.

Mr. Stewart declared that many of his customers are convinced that sprayed corn is raised less expensively, that it requires less labor to control weeds, and yields more than unsprayed corn. He reported that during each of the past three seasons, he has treated from 1,500 to 2,500 acres of corn for weeds, and in addition, sold from 400 to 600 gallons of ester 2,4-D, which, as he put it, "will spray a lot of corn."★★

S. Carolina Holds Big Fertilizer Conference

STRESSING more efficient use of fertilizers and lime, speakers at the annual state-wide South Carolina fertilizer conference emphasized the importance of use of plant food and lime for increasing crop yields. The conference was held at Clemson Agricultural College, Clemson, S. C., January 15. Dr. R. F. Poole, president, Clemson College, called the meeting and Dr. B. D. Cloaninger, head, Clemson Department of Fertilizer Inspection and Analysis, presided. About 400 representatives of the fertilizer industry, agricultural workers and other interested persons attended.

Both D. W. Watkins, director, Clemson Extension Service, and Dr. H. P. Cooper, director, South Carolina Experiment Station, stressed the importance of the use of lime along with fertilizers for increased crop yields. Both stressed the importance of grass and livestock in the balanced program of farming now being developed in the state and urged efficient use of lime and fertilizer to produce the grass and other feed crops needed for livestock production.

Dr. H. G. Allbritten, associate agronomist, South Carolina Experiment Station, pointed out the advantages of soil testing in determining soil acidity and deficiency of one or more plant food elements. He reported that progress is being made in completing a soil-testing laboratory at Clemson, which will be second to none in the South.

Hugh A. Woodle, leader, Clemson Agronomy Extension Work, pointed out that a more efficient use of lime and fertilizer must be made if the fewer people now on farms are to provide more food and fiber to meet the needs of an increasing population.

Bachman Smith, Charleston, and A. D. Kincaid, Columbia, called attention to the need for close cooperation among fertilizer manufacturers, dealers, and farmers in order to extend the handling season of fertilizers over a longer period.

Other speakers on the program and points presented by each included the following: Albert Muchs, Charleston, who suggested close cooperation between those who recommend the use of insecticides and those who handle insecticide materials in order

Left to right: (1st row) Dr. R. F. Poole, president, Clemson Agricultural College, A. D. Kincaid, Southern Cotton Oil Company; D. W. Watkins, director, South Carolina Extension Service; H. A. Woodle, leader, Extension Agronomy Work, Clemson; Dr. H. P. Cooper, director, South Carolina Experiment Station; and Dr. M. D. Farrar, State Entomologist.

Left to right: (2nd row) Albert Fuchs, Naco Fertilizer Company; J. N. Davis, Epting Distributing Company; J. E. Youngblood, chairman, State Commission on Marketing; B. D. Cloaninger, head, Department of Fertilizer Inspection and Analysis; Dr. H. G. Allbritten, associate agronomist; Bachman Smith, Charleston, S. C.

to avoid shortages, and J. N. Davis, Leesville, who reported shortages in certain types of planting seed and advised buyers to get the best seed available.

Henry Johnson, Farm Credit Administration; R. H. McElveen, Farmers Home Administration; and E. R. Alexander, executive manager, South Carolina Bankers Association, reported that credit for farmers in 1953 is limited only by sound credit requirements, but they urged that farmers be advised to use credit wisely.

Dr. M. D. Farrar, entomologist, South Carolina Experiment Station, reported progress is being made in the use of insecticides in fertilizer. Mr. Cloaninger briefly outlined points in existing fertilizer laws. J. E. Youngblood, chairman, State Commission of Marketing, stressed the need for greater efficiency in marketing farm products.

•

N. C. Pesticide School

Some 175 persons attended the North Carolina Pesticide Conference held January 22 & 23 at North Carolina State College, Raleigh. The program for the fifth annual pesticide school included talks on herbicides, fungicides, insecticides and rodenticides. Clyde F. Smith, head of the school's department of entomology, presided at the first morning's session, while J. H. Jensen, Raleigh, was chairman of the second day's meeting.

Featured on the program was a talk by Dr. Fred C. Bishopp, assistant chief, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C., who spoke on "Using Insecticides Safely."

•

Md. Safety Meet May 7

The Governor's Safety Conference, covering the State of Maryland, will be held at the Lord Baltimore Hotel, Baltimore, Md., May 7 and 8, it has been announced. A. B. Pettit, Davison Chemical Corp., Baltimore, stated that safety in fertilizer plants will be a prominent subject for discussion at the two-day meeting.

Joins C.C.C. Co. Division

James R. Wheatley has joined the market-development group for "Crag" agricultural chemicals, according to an announcement by H. B. McClure, vice-president, Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation.

Mr. Wheatley received a B.S. degree in agriculture from the University of Delaware in 1950. In 1951, he received his M.S. degree in agriculture, after conducting research in the nutrient-foliar feeding of plants at the University of Delaware Agricultural Experiment Station.

•

H. H. Hollesen Dies

Harry H. Hollesen, formerly vice-president of Synthetic Nitrogen Products Corp., New York, died January 26 at the age of 70. Mr. Hollesen had resigned his position last November first because of failing health.

Before his association with Synthetic Nitrogen Products, he was for many years with the New York office of N. V. Potash Export, My. and in the early 1920's, operated his own business under his own name.

•

Mente N. Y. Manager Dies

Mente & Co., Inc., has closed its New York office at 452 Fifth Ave., since the recent death of the New York manager, Brant Holme, the company has announced.

S. W. Branch to Meet

P. J. Reno, chairman of the Southwestern Branch, American Association of Economic Entomologists,

P. J. RENO

has announced that plans for the group's annual meeting at the Galvez Hotel, Galveston, Texas, are complete. The convention will be held two days, February 26 and 27. Mr. Reno, with Hercules Powder Co., Dallas, Texas, has indicated that some 300 persons are expected to attend.

•

How to Mail Poisons

The Post Office Department has recently issued proposed changes in the postal laws and regulations covering the mailing of poisonous materials including insecticides, disinfectants, rodenticides, drugs, medicines or other chemicals of this nature.

In a twelve-page summary of requirements and explanations, specimen labels and other details are given. Copies are available from the Post Office Department, Washington, D.C.

NAC PROGRAM

(*Continued from Page* 49)

The final day's session, Friday, March 13, will begin at 10 a. m. with president Mohr in charge. Joseph A. Noone, NAC technical adviser, will speak on the subject of pending legislation to start off the morning's activity.

"Systemic Insecticides" are to be discussed by Dr. H. G. Johnston, head, Research and Development Unit, National Cotton Council, Inc., Memphis, Tenn.; followed by a talk by James T. Conner, Jr., entomologist, Taylor Chemical Co., Aberdeen, N. C., on "NAC and the Formulator."

Pests affecting forests and lumber will be discussed, and a talk is to be given by Dr. Eugene Butler, editor, Texas Edition of the *Progressive Farmer*, Dallas, Texas.

Dr. Charles E. Palm, professor and head of the Department of Entomology, Cornell University, Ithaca, N. Y., and president of the Entomological Society of America will report on his recent trip abroad in a talk on "Foreign Pesticide Developments."

The program will end in a discussion by John D. Conner, NAC counsel, on "Liability and Safe-Use" of pesticides.

New Books . . .

Untaken Harvest by George Ordish. Published by Constable & Co., Ltd., London, England. 172 pages, 5½ x 9 inches, cloth binding, price 15s.

This text deals with the economics of pests and diseases in agriculture. The economic effects and extent of crop losses in the United States, United Kingdom, S. Africa, Australia, Spain, and Latin America are reviewed, and it is pointed out that such loss is not necessarily best expressed in terms of money, but rather as a waste of land and labor. The author reviews briefly the methods of combating loss, and gives statistics on world consumption, production, export and import of pesticides.

* * *

Sanitation for the Food-Preservation Industries by The Association of Food Industry Sanitarians, Inc. Published by McGraw-Hill Book Co., New York. 284 pages 6 x 9 inches, cloth binding, price $5.00.

This text presents the workable principles and methods of good plant sanitation, including the organization of a sanitation program, inspection techniques, etc. Prevention and control of rodent and insect infestation, a review of common insecticides and use of same are discussed also. Detection of foreign matter in stored foods, tests for detecting rice and granary weevil infestation in grains are among the subjects reviewed.

* * *

Soils and Soil Fertility by L. M. Thompson. Published by McGraw-Hill Book Co., New York. 338 pages, 6x9 inches, cloth binding, price $5.00.

Introductory chapters of this book deal with the physical, biological and chemical properties of soils, and the formation and classification of soils. The remaining chapters deal with fertility and management. Specific attention is given to phosphorus, potassium, sulfur and the minor elements, while other chapters discuss the causes of variations in plant composition.

The book is designed as an elementary course in soils, and presents a firm introduction to this study. New concepts, such as the weathering of potassium minerals and the relation of potassium availability to aeration and to calcium availability are included. Other discussions deal with the rates of weathering of minerals, and the relationship of pH to per cent base saturation.

A valuable section concerns fertilizers: their use, proper balance in fertilizers, sources of supply in the United States, factors affecting fertilizer use. More than 130 figures and photographs illustrate the book. A bibliography of 37 references provides additional material for further study.

* * *

Insects. The Yearbook of Agriculture 1952. Published by the U. S. Dept. of Agriculture Washington, D. C., 924 pages, 6 x 9 inches, cloth binding price $2.50.

Anyone concerned with agricultural and other pests will find this text extremely valuable. The leading entomologists and agriculturists of the U.S.D.A., such as F.C. Bishopp, G. J. Haeussler, H. L. Haller, W. L. Popham, B. A. Porter, E. R., Sasscer, J. S. Wade, B. Schwartz, K. Quisenberry, E. McGovran, and A. Stefferud have reviewed the material for the book, which includes the following discussions: Insects as Helpers, Insects as Destroyers, Nature of Insecticides, Applying Insecticides, Warnings as to Insecticides, Resistance to Insecticides, Fumigants, Quarantines, Economic Entomology, Household Pests, Insects on Cotton, Fruit, Field Crops, Vegetables; Pests on Ornamentals; Livestock and Insects, Forests, Trees and Pests; Insects and Wildlife.

In addition to 780 pages of discussion and sketches of the above matter, the book includes 72 valuable color plates of some important insects.

* * *

Solubilities of Inorganic and Organic Compounds By A. Seidell, and W. F. Linke. Published by D. Van Nostrand Co., Inc., New York. 1254 pages, 6 x 9 inches, cloth binding, price $12.50.

This volume is supplementary to the third edition of Solubilities, and provides new material collected over the past ten years. In addition to solubility data of the various compounds, the book includes sections on ternary systems yielding two liquid layers, and on the theory of electrolyte solubility.

* * *

Agricultural Chemicals by Donald E. H. Frear. Published by John Wiley & Sons, New York. 6 x 9 inches, cloth binding, two volumes: Vol. 1, 902 pages; Vol. 2, 876 pages; each volume $9.50.

The first volume of this set, on the principles of agricultural chemistry, includes the chemistry of the basic compounds of biological importance, the chemical processes of fundamental importance in agriculture, plant and animal chemistry. Discussions on absorption and utilization of inorganic substances in plants; and a chapter on soil chemistry are of particular interest.

The second volume of 24 chapters contains sections on the chemistry of major agricultural products; fertilizers and soil amendments; the nutrition of farm animals; pesticides and commercial agricultural chemistry. Important discussions are contained on the manufacture, control, properties and economics of fertilizers; use and production of insecticides, fungicides, and herbicides. Concluding chapters deal with the agricultural patents and chemurgy, in which the industrial uses of agricultural products are reviewed.

Both books have been prepared by recognized specialists and compiled by Dr. Frear.

(*More Reviews, Page* 143)

U. S. I. Opens New Allethrin Plant

U. S. Industrial Chemicals Co., Division of National Distillers Products Corporation, has announced full-scale production of allethrin at its new plant at Baltimore, Md. The company states that the operation of the new plant will make the synthetic insecticide available for consumer needs throughout 1953.

The needs of the Korean battlefields hastened allethrin development as a commercial product, when the military forces indicated their demand for a rapid, instantaneous-type insecticide to protect United Nations' forces from malaria-carrying mosquitoes. The new material, on which USI has export rights control, becomes a companion insecticide to piperonyl butoxide, piperonyl cyclonene and other chemicals now produced by the company.

Piperonyl butoxide and pyrethrins are widely used by formulators.

Allethrin was first synthesized by Milton S. Schechter, Dr. Frederick B. LaForge and Nathan Green, chemists of the U. S. Department of Agriculture's Bureau of Entomology and Plant Quarantine. It is known technically as the homolog of Cinerin I.

In spite of the chemical similarity of allethrin and pyrethrins, allethrin can not be used as a complete replacement for pyrethrins. Nevertheless, allethrin is expected to serve as a valuable adjunct to pyrethrins.

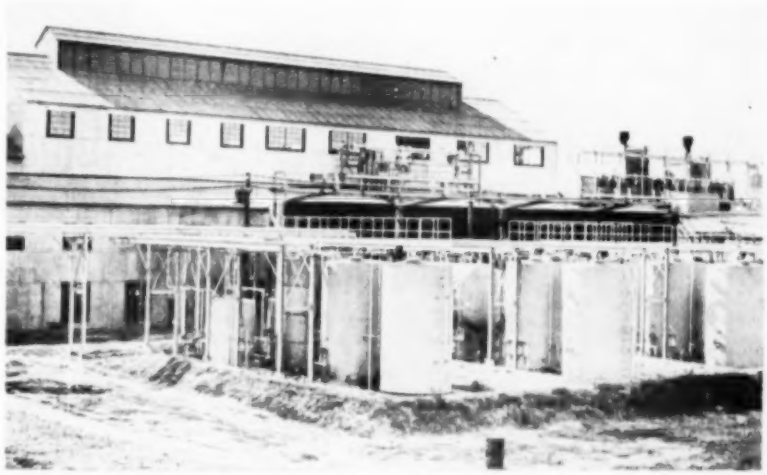
An effective insecticide in itself, allethrin has proved valuable as an insecticidal agent when used with certain synergists, particularly piperonyl butoxide, "Sulfoxide," synergist 264 and n-propyl isome. Its effectiveness against insects varies with the type of synergist employed, mode of application and other factors.

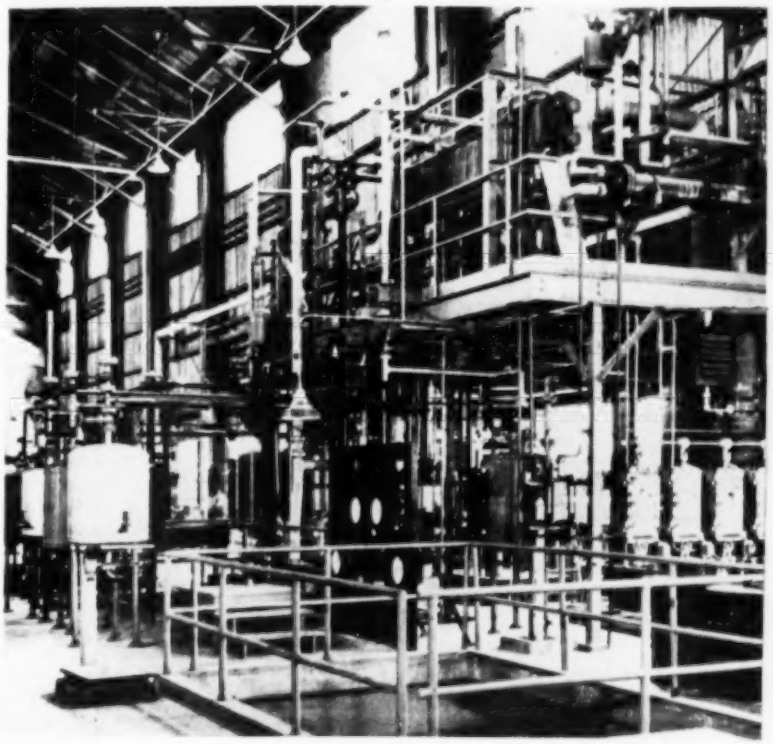
In giving credence to the contention that allethrin is not a substitute for pyrethrins, USI entmologists have found that when used alone as an insecticide, or used in combination with most synergists, allethrin's reaction differs in varying degrees compared with that of pyrethrins.

In the case of aerosols, it appears that combinations of allethrin and of allethrin and pyrethrins with piperonyl butoxide will be effective and economically competitive with older formulas.

Top photo: General view of exterior of USI's allethrin plant in Baltimore, with tank farm in foreground.

Lower photo: Interior photo of the Baltimore allethrin plant of U. S. Industrial Chemicals Co. showing equipment for recovery of solvent from the initial reaction in the preparation of allethrolone, one process leading to finished allethrin products.





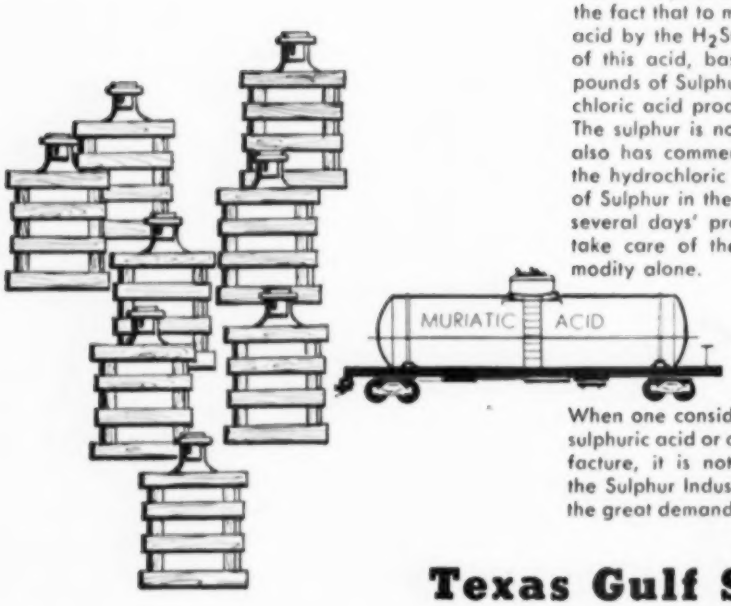
Sulphur

Loading a ship with Sulphur at Galveston

Thousands of tons mined daily, but where does it all go?

PARAPHRASING an old saying: 'It takes a chemical to make a chemical,' certainly applies to hydrochloric acid.

No chemical engineer has to be told how hydrochloric acid is made but sometimes with the mind focussed on the word "hydrochloric" little thought is given to another word "sulphuric." It is this word that calls attention to the fact that to make one net ton of 20° Bé hydrochloric acid by the H_2SO_4 process requires about 950 pounds of this acid, basis 100%, which is equivalent to 320 pounds of Sulphur. About one third of the annual hydrochloric acid production is made by the use of sulphuric. The sulphur is not lost because salt cake, a by-product, also has commercial value. But any way you figure it, the hydrochloric acid industry is an important consumer of Sulphur in the form of sulphuric acid. In fact, it takes several days' production from all the Sulphur mines to take care of the annual production of this one commodity alone.



When one considers all the other chemicals that require sulphuric acid or other Sulphur compounds for their manufacture, it is not difficult to appreciate how faithfully the Sulphur Industry is serving industry today in spite of the great demands made upon it.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

So. Weed Conf. Scheduled

Plans for the sixth annual Southern Weed Conference, February 11-13 at the Jung Hotel, New Orleans, call for a general review of progress in weed control research and special sessions dealing with weeds in cotton and other field crops. Brush control, basic studies of plants and their reaction to herbicides, as well as other problems are on the agenda for discussion.

Several meetings of committees and sub-committees are scheduled on the night of February 11. The first general session will be held on the following morning. Representatives of the U. S. Department of Agriculture, land-grant colleges, and private industry will report on weed control studies during 1952.

Dr. S. J. P. Chilton of Louisiana State University is the conference program chairman. Other officers include Dr. D. A. Hinkle, Head, agronomy department, University of Arkansas, president; Dr. W. B. Ennis, head, department of plant physiology and pathology, Mississippi State College, vice-president; Dr. G. C. Klingman, professor of agronomy, North Carolina State College, secretary-treasurer.

The conference will be open to all persons interested in weed control.

•

Marathon Expands Plant

Marathon Corporation has announced completion of a two-year, $500,000 expansion program in its Chemical Division plant at Rothschild, Wisconsin. Thirteen large process tanks and four major pieces of equipment have been added to existing facilities, to raise monthly production by 1¼ million pounds of lignosulfonate powders. This brings the company's total output to 3¼ million pounds of powders and nearly 3 million pounds of solids as liquid products per month.

The firm reports that putting the new facilities into operation brought up the problems of an adequate basic raw material supply. The lignosulfonates which Marathon had manufactured to date were derived from the sulfite effluent liquor of the company's Rothschild, Wisconsin, pulp mill. Now, to fully utilize its new production facilities, the Chemical Division has arranged to buy additional quantities of sulfite liquor from another paper manufacturer; a heretofore unheard-of proposition.

Marathon Corporation is a pioneer in the field of lignin chemistry, having begun commercial production of lignosulfonates in 1937. Applications for these materials include insecticides, leather tanning, and the black masterbatching of rubber, to name a few.

To date, Marathon Corporation has spent more than $1,750,000 on its chemical plant and equipment, as well as more than $2,000,000 on research, to make useful products from sulfite liquor. Although the chemical division operated continuously in the red until 1945, for the past two years, the complete productive capacity of the chemical plant has been sold out. With the new and improved plant facilities it is expected that this division's gross sales will have increased by 50 per cent within the next twelve months, the company said.

•

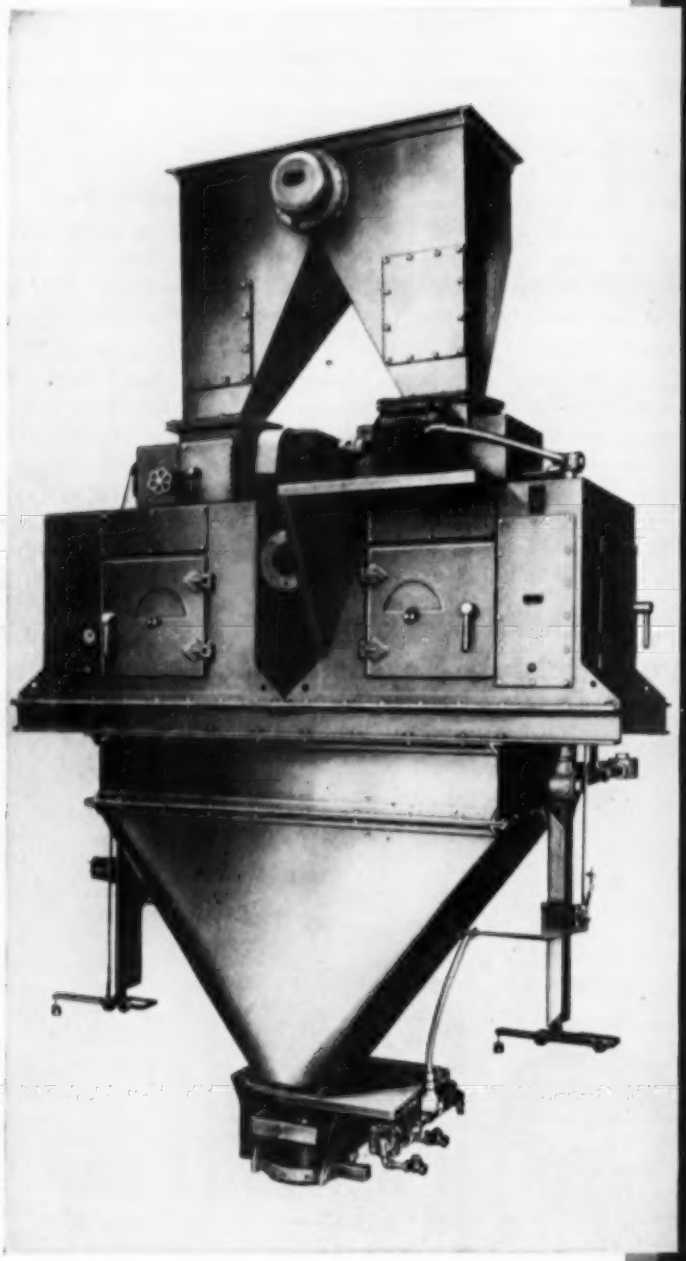
Mowry to Wisconsin Post

Wils Mowry, formerly with S. B. Penick & Co., New York, has joined Hopkins Agricultural Chemical Co., Madison, Wisconsin.

In his new position, Mr. Mowry will assist James Hopkins, president of the firm, in sales development work on warfarin rodenticides and in developing industry-wide distribution of a new line of general insecticides and custom-blended insecticidal dusts to be handled by the Wisconsin concern.

Eye Catching Herbicide Containers

New weed killer, "Emlen 2,4-D," is marketed in eye-catching bottles by Crawford Industries, Inc., Oil City, Pa. Comes in 8 ounce, pint and quart sizes. Bottles are emerald green. Product is being distributed nationally through various retail outlets including different feed mill cooperatives.



Designed for bagging fertilizers with *speed* up to 20 50-lb. or 80-lb. bags per minute[1]; *accuracy* usually to the split ounce, with a maximum range of 2 to 4 ounces; *savings* to $15 per hour[2] using economical open-mouth bags . . .

. . . this is the Richardson E-50 Duplex Automatic Bagging Scale . . .

. . . dust-tight, corrosion-resistant with *stainless steel.* The E-50 is also built in single and triplex units. Bulletin 0552 gives complete specifications—we'll be glad to send you one.

[1] Slightly slower on 100-lb. bags
[2] Cost analysis figures on request

Richardson

MATERIALS HANDLING BY WEIGHT SINCE 1902

RICHARDSON SCALE COMPANY
Clifton, New Jersey

Atlanta • Boston • Buffalo • Chicago • Detroit • Houston
Minneapolis • New York • Omaha • Philadelphia
Pittsburgh • San Francisco • Wichita • Montreal • Toronto

® 8776

1% Increase Granted

An increase of 1 percent in the ceiling price of all mixed fertilizers was granted January 21 by the Office of Price Stabilization. The order affects both mixes and superphosphate, and applies to all mixed fertilizer producers, whether their ceilings were determined by the General Ceiling Price Regulation or by Ceiling Price Regulation 22.

The increase was authorized in Supplementary Regulation 131 to the GCPR and Amendment 10 to SR 7 to CPR 22. It was indicated that the 1% increase may be added to the old ceiling, based on an f.o.b. production-point basis. But when the ceiling price was for delivered basis sales, the increase is allowed on the net price after average outbound freight costs are excluded.

Fertilizer manufacturers had asked OPS early in December, 1942, to make a survey of industry earnings standards, following the 10% increase in the price of ammonium sulfate. The industry earnings standard provides that an industry may get higher ceilings if it can show its current earnings have dropped below 85% of its average earnings in the best three of the four years, 1946 to 1949. The one percent increase was regarded by OPS as being sufficient to restore this ratio.

DEFOLIATION

(*Continued from Page 75*)

tive effort with the defoliation workers in the field and answers questions regarding the effective and safe range of dosage under various conditions; effects of overdosages; effect on yield and quality of a crop; and the amount of residues involved.

A study of the mechanism of action from the standpoint of response or plant conditions favorable for satisfactory defoliation must also be considered. Although this is largely a function of state and federal workers, the companies can cooperate to a large extent by providing funds and by working together in certain experiments. For example, he said, American Cyanamid Co., provided to several interested parties a "Cotton Leaf Hygrometer" which helps determine the condition of plants and their possible response to defoliants.

Industry can do well to cooperate in the study of methods of application, Mr. Walworth declared. "Of course, the airplane spraying and dusting outfits and manufacturers of their equipment as well as manufacturers of ground equipment, are much more involved in this function than in the chemical industry, but it is to our interest to work with them as much as possible, particularly in providing information as to the type of distribution that our products require for best results."

Although it goes without saying, that industry is largely responsible for the education necessary to bring about wider acceptance and knowledge of defoliation, Mr. Walworth indicated that more might be done along this line.

TECHNICAL BRIEFS

(Continued from Page 85)

the guesswork out of commercial fumigation of many agricultural commodities, providing the research worker with a simple way of measuring in seconds fumigant gas concentrations that previously required nearly an hour. It is also expected to prove useful to Federal and State plant quarantine officials who check on the effective fumigation of many commodities crossing State and national boundaries.

Principally, G. L. Phillips and J. W. Bulger, entomologists of the USDA's Bureau of Entomology and Plant Quarantine, have modified and calibrated a thermal conductivity instrument to determine methyl bromide concentrations by measuring the ability of various concentrations of this gas to conduct heat. It will likely be usable with other fumigants as soon as their thermal conductivity is determined at different concentrations.

The completed unit, as assembled by the entomologists, is about the size of an overnight bag and light enough to be moved about readily by one person. Basically, it is made up of tungsten filaments that are electrically heated by passing a known constant current through them. Methyl bromide gas from the fumigation chamber is then pumped past the heated wires and the ability of the fumigant to conduct heat is measured by the change of electrical resistance in the heated wires. As methyl bromide becomes more concentrated, the electrical resistance of the filament changes. By determining the electrical resistance associated with known gas concentrations, the unit can be calibrated so that methyl bromide concentrations can be read directly from the unit.

COMMON NAMES

(Continued from Page 52)

NABAM** ...disodium ethylene bisdithiocarbamate. (Dithane*).

Active Ingredient

Nabam (Disodium ethylene bisdithiocarbamate) .....%

ZINEB** . . . zinc ethylene bisdithiocarbamate.

Active Ingredient

Zineb (Zinc ethylene bisdithiocarbamate) .....%

ZIRAM . . . zinc dimethyl dithiocarbamate. (Zerlate*).

Active Ingredient

Ziram (Zinc dimethyl dithiocarbamate) .....%

THIRAM** . . . tetramethyl thiuram disulfide. (Thiram).

Active Ingredient

Thiram (Tetramethylthiuram disulfide) .....%

The names of the active ingredients followed by a question mark, will probably be accepted, but have not yet been officially adopted by the Department of Agriculture.

SUBURBAN PROPANE

(*Continued from Page 48*)

determined in some crops. Techniques for treating corn and small grains, however, have been perfected, and it is in the fertilization of these crops that Suburban "Hi-N" finds its greatest acceptance. To further investigate the behavior of the new fertilizer in the soil and to study amount and timing techniques for all crops, the Suburban Farm Service Co. has established a fellowship at Rutgers University, New Brunswick, N. J.

SUBURBAN spokesmen are quick to state that agricultural ammonia is not a cure-all; rather it is a rich source of nitrogen as low in price as any other source of nitrogen and lower than most. Most soils of course require other plant foods such as phosphate and potash as well as nitrogen. Therefore, to be used effectively, agricultural ammonia must be used in conjunction with these other nutrients.

The soil should be slightly moist to obtain best results in applying agricultural ammonia. Under these conditions, nitrogen bearing particles attach themselves to and are readily sealed in the soil. A muddy soil makes application difficult and many times impossible.

Some "know-how" is required in actual application itself, for ammonia vapor, if released carelessly, will burn plant foliage. The average operator can easily learn to apply agricultural ammonia correctly in the course of a few hours.

In experiments carried on at the New Jersey Agricultural Experiment Station during 1950, application of 122 pounds of anhydrous ammonia to corn raised the yield of grain from 26.2 to 107.5 bushels per acre, and the yield of silage from 10 to 15 tons per acre. King Farms of Morrisville, Pa., showed in tests carried on during the 1950 season that application of anhydrous ammonia at a rate of 76 pounds per acre raised the yield of spinach from 10,735 to 17,176 pounds per acre; or an increase of about 60%. Additional development work of this kind carried on in other parts of the country on a wide range of crops showed similar improvements in the yields when anhydrous ammonia was tried.

During 1951, new and greater results were achieved with the use of ammonia on fruit and vegetable crops. In one instance, where a farmer had decided to cut down his peach orchard, Suburban "Hi-N" came to the rescue. As a test, four pounds of ammonia were applied to one peach tree. The yield of that one tree was double that of the other trees. The peaches were so much firmer, larger, and juicier that they brought a better price.

Despite the demand for ammonia from other industries, it is anticipated that future requirements of agricultural ammonia will be met readily. If the past year is any indication, the future of anhydrous ammonia as a commercial fertilizer is indeed promising.

FUMIGATION

(*Continued from Page 41*)

could be volatilized in the air stream. The dosage was introduced in 8-½ minutes, circulated for 15 minutes longer, with exposure of 24 hours. The load was 2,500 tons.

Rate of the initial movement of the air-gas mixture through the seed mass was determined by pressure readings from above and beneath the load of cottonseed. An increase in pressure and a decrease in vacuum indicated that the mixture was moving through the seed. (See pressure and vacuum readings in table 1.)

At Waxahachie, only two gas-sampling ports were available — in the tank wall about 5 feet from the ground and in the top or cone part of the tank above the load. Samples were withdrawn through probes inserted into the load at various depths. (Probes were made of ⅛-inch pipe and were in sections for convenience in handling.) The samples were analyzed for methyl bromide concentration by ethanolamine hydrolysis and bromide determination by the Volhard method. No biological samples were used.

Results Satisfactory

RESULTS of gas analyses 2-½ hours after the start of the fumigation showed a concentration of 39.2 ounces per 1000 cubic feet at a point 14 feet from the bottom and 23 feet from the wall. A concentration of 35.2 ounces was recovered above the load.

At Oklahoma City, four 328-pound cylinders of methyl bromide were used, making a rate of 4.8 pounds per 1000 cubic feet. There was less pressure in the cylinders than at Waxahachie (see table 1), because of lower temperature, and 45 minutes were required for gas introduction. Circulation continued for 15 minutes longer, and the exposure was for 24 hours. The load was 3,000 tons. Five sampling places were provided in the tank wall, and samples were withdrawn at various intervals. Results of gas analyses are given in table 2.

The results of both fumigations are in close agreement with the distribution pattern found sufficient to kill the larvae of the pink bollworm in loads of 550 tons of cottonseed. Therefore, these data are considered evidence that fumigation of cottonseed loads of these magnitudes is possible and satisfactory.★★

FUNGICIDE TESTS

(*Continued from Page 73*)

incongruity in data. Hence the desirability of duplication and repetition of seed treatment tests is emphasized.

Trends in Seed Treatment

MANY changes have been made in the materials and methods employed in cereal seed treatment in the 30 years since copper carbonate, applied with a barrel treater, was the standard procedure.

Copper carbonate dust is still used as a bunticide in some wheat-growing areas. This is partly because some growers are reluctant to change

to new and unfamiliar materials, and partly because there is still a fear of danger associated with the handling of the more toxic mercury dust fungicides.

The introduction of the slurry method of treatment eliminated the dust hazard from seed-treatment operations, especially in commercial seed-treating plants. Workers in these plants objected to the irritation caused by the flying dust involved in treating seed, and also to the discomfort of wearing dust respirators all day long, especially in warm weather.

Slurry treatments, however, do not eliminate the dust problem after the grain has dried, especially when it is handled in bulk. Considerable flying dust is encountered when the treated grain pours from the storage bin into the grower's truck. The use of sticking agents in slurry treating does not seem to eliminate this nuisance. Some slurry fungicides are being conditioned with an oily additive designed to reduce their "dusting" after the seed dries, but its effectiveness has not yet been fully determined.

Liquid treatments now on the market or under test may be applied to the seed by the "quick" or "short" wet method, without dilution, at rates ranging from ½ to 4 liquid ounces per bushel, according to the directions of the different manufacturers. Examples of these are "Panogen," "Setrete," "Pentrete," "Tag 331," and "Vancide 51." Thorough agitation of the seed is essential after these chemicals have been applied. These fungicides may be applied also in a slurry treater after first diluting them with the proper amount of water. They completely eliminate the dust nuisance both during and after treatment.

Liquid treatments of this type necessarily must be volatile in order to be effective. This suggests the hazard of inhaling fumes from the liquids or from the treated seed. The danger may be reduced by the use of fans and proper ventilation. Mercury treatments in dust form also are volatile, and it is inadvisable to

work continuously in closed unventilated buildings containing large amounts of seed treated with these materials.

In some wheat-growing areas of the Pacific Northwest, much of the work of treating seed is done by seed-treating plants. In some localities the growers sell all their wheat to the seed dealer, who selects the best seed of the popular varieties, cleans and treats it, and sells it to the growers. In other areas, the growers save a portion of the best seed they raise and take it to the seed dealer or to a cooperative plant, for cleaning, treating, and storing until seeding time. In general, the central seed plants are better equipped than are the growers to do the cleaning and treating because they can afford to install more efficient machinery for that purpose. The cost of custom cleaning and treating ranges from 10 to 15 cents per bushel.

On smaller farms much of the treating is still done with simple home-made treaters, or mobile cleaning and treating outfits that travel from farm to farm. These intinerant outfits invariably use dust fungicides and hence create a dust hazard. The types observed by the writer usually employed a suction fan to protect the workers, especially those bagging the seed. Arny, at the Wisconsin Station, found that a fan so used may remove one-half or more of the dust as the seed leaves the mixing chamber. He used the Leben and Keitt's bioassay method to test the relative accuracy of 15 dust treaters of three different makes, and 5 slurry treaters of two different makes, in applying "Ceresan M" to oats at rates ranging from 0.25 to 1 ounce per bushel. He tested four samples from each machine. The average amount of "Ceresan M" applied by the dust machines ranged from .07 to 0.84 ounce per bushel, whereas that applied by the slurry machines ranged from 0.26 to 0.85 ounce per bushel. These results indicate that slurry treaters are more nearly accurate than dust treaters. Advocates of the liquid seed treatments, applied by the "short" or "quick" wet method, maintain that this method of application is superior to the others in this respect because all of the fungicide that is applied is absorbed by the seed. This form of treatment is now rather widely used in the midwest.

Cereal Disease in the S. E.

CEREAL disease control in the Southeast presents problems somewhat different from those encountered in the Central United States or in the Pacific Northwest. High average temperatures, relatively high humidity, and mild winters favor seed deterioration, insect infestation, and infestation of the soil with fungi that cause seed-rot, root-rot, and seedling diseases. Prominent among these fungi are species of *Helminthosporium*, *Fusarium*, *Pythium*, and *Rhizoctonia*.

It is possible that soil treatment as well as seed treatment is needed in this area. In 1948 C. H. Arndt, in South Carolina, treated 20 x 20 foot plots with methyl bromide

before sowing oats in certain fields that had produced poor stands and yields in previous years. In one county the yield of the treated plots was 77 percent greater than that of corresponding untreated plots; and in another county the treatment resulted in a 36 percent increase. These results were obtained in spite of very dry weather shortly before maturity. The stands in the treated and untreated areas were about alike. The differences in yield presumably were due to the heavier yield per culm in the treated areas, because of the elimination of undetermined pests in the soil.

R. W. Earhart, at Gainesville, Florida, treated seed of Southland oats with six different fungicides, including two organic mercurials and four non-mercurials, in the fall of 1951. Different portions of seed were treated with each chemical and held in the laboratory in closed kraft paper bags for 4, 28, and 49 days before sowing. The seed was heavily infested with *Helminthosporium avenae* and *H. sativum*. The different seed lots were planted in four-foot nursery rows with eight replications, properly randomized. Stand counts were made ten days after emergence. The average percentage of infected plants grown from seed treated with each fungicide and from the untreated seed was obtained by taking a 20-seedling sample from each row to the laboratory for the visual determination of diseased seedlings. An "Index of protection" for each treatment of each of the three seed lots was calculated by dividing the average stand from each by the average percentage of infection. These data were subjected to an analysis of variance, and the results are presented in Table 3. The results of this test indicate that seed treatment with "Ceresan M" and "Panogen" (either dilute or concentrated) will reduce materially the amount of infection in Southland oat seedlings caused by these seed-borne fungi.

SOLUBLE PLANT FOOD

(*Continued from Page 39*)

nutrients). Illustrative is a concentrated 15-30-15 garden fertilizer that is also recommended (20) for use with house plants. Also illustrative of the high-analysis concentrates being offered the gardener, is "Ra-Pid-Gro" with its 23-21-17 formula, "Hy-Gro" with its 13-26-13 composition, "Plant-Prod" with a 15-30-15 make-up and "Nurish" with a balanced 20-20-20 formula. There are many others, of course.

Although the majority of preparations for making fertilizer solutions are provided in dry form, a few, as previously indicated are marketed as concentrated liquids. As a rule, because of the difficulty of bringing the ingredients into stable solutions, the analysis of plant foods offered in liquid form usually runs about 10-10-5, 15-8-8 or the like. (21) An apparent exception to the rule is the liquid concentrae ("Sprout") with the high analysis of 12-20-10. It is being offered to gardeners as a multi-purpose product suitable for

soil and foliage feeding and for making transplanting solutions.

The proportions in which these preparations are used are determined not only by the intended application but also by the nutrient concentration. The following table, adapted from data given in a discussion (7) on the commercial (e.g. greenhouse) use of liquid fertilizers, indicates how the concentration influences the use-ratio:

Formula	Lb./100 gal.
20-20-20	2
20-10-20	2
15-30-15	3
13-26-13	3
12-12-12	3½
10-10-10	4

To prepare a specific fertilizer formula, it is necessary to know the proportion of primary nutrients provided by the available raw materials. Such information is often available from standard chemical composition tables or from the analytical data provided by the raw materials suppliers. With such information at hand, it is then possible to use one of several methods for computing the amount of each nutrient carrier required to yield the desired formula. Methods for making the requisite calculations are given in detail, not only in standard reference texts, like those by Miller and Turk, (16) and by Waggaman, (22) but also in literature (23) supplied by the U. S. Department of Agriculture.

Labels, manufacturers' literature and reports issued by the various states provide analytical data on the primary nutrients present in soluble plant food concentrates. They do not, as a rule, provide information regarding the specific chemical compounds employed in the actual manufacture of the concentrated soluble fertilizers. This is quite understandable because, in the main, the consumer is not concerned with the nature of the constituents. However, such knowledge is obviously invaluable to anyone contemplating the production of concentrated fertilizers for soluble use.

Fortunately, some pertinent information along these lines is provided in technical reports and by some raw material suppliers. From the latter source (24) comes the following typical formulation that will give a plant food containing a 20-20 ratio:

	per cent
Diammonium phosphate	39.0
Potassium nitrate	46.0
Urea	15.0

According to Sayre (5) a completely water-soluble mixture for making starter solutions may be prepared from equal parts of diammonium phosphate and monopotassium phosphate. Such a mixture is sold under a guaranteed formula of 12-52-17. When used in a proportion of 5 pounds per 50 gallons of water, this mixture has given excellent results in extensive tests. A commercial preparation ("Take-Hold"), described by its manufacturer as a "scientifically balanced mixture of ammonium and potassium phosphate," has a similar formula of 10-52-17. It is sold as a starter solution mix.

It is also offered for resale, either under the original name or under the dealer's trade name.

Also informative are the data provided by Pirone (14) on the results with a commercial preparation ("Ra-Pid-Gro") which he describes as a 23-21-17 completely soluble chemical fertilizer with minor elements added. He states that the nitrogen in this mixture is obtained from crystal urea, monoammonium phosphate and potassium nitrate, the phosphoric acid from monoammonium phosphate; and the potassium from potassium nitrate and monopotassium phosphate.

Small quantities of chemicals to provide both the secondary nutrients (calcium, sulfur and magnesium) and the trace or minor elements are included in some of the soluble plant food concentrates. In a few instances vitamins and plant hormones are also present.

Some agriculturists (12,20) feel that the addition of trace elements to garden fertilizers is seldom necessary. As pointed out in one report, (4) the trace elements, namely boron, copper, iron, manganese, molybdenum and zinc, are not generally contained in fertilizer mixtures in appreciable amounts. Where known to be deficient, they should be applied in the form of the soluble salts of the elements concerned. This report warns that application of trace elements, when not required, may cause damage to the plants instead of aiding them. A similar warning on the dangers of overdosage is given in a U.S.D.A. publication on fertilizer production. (23).

However, several of the soluble garden fertilizers, including some of the better known brands, do contain small proportions of zinc, copper, manganese, boron, iron. Occasionally, traces of cobalt, molybdenum and even iodine are provided. These materials are provided in the form of their soluble salts, generally as the sulfates or chlorides. Boron, of course, is usually included as borax (sodium borate).

Mention should be made of the growing practice of putting trace elements into deficient plants by spraying the foliage with nutrient solutions.(12,25). As with the application of primary nutrients, the foliage spraying of minor elements to correct deficiencies is now under investigation.(26) Of interest in this connection is a foreign patent (27) describing the preparation of an aqueous solution containing 0.01 per cent of magnesium chloride and 0.005 per cent of calcium nitrate. The solution is sprayed into plants to increase their growth.

Vitamins, notably vitamin B_1, have been used for a number of years in various fertilizer formulations and these nutrients are also included in a few of the newer soluble concentrates. Over a decade ago, Sayre (28) found that the vitamin B complex was of no value in starter solutions.

Without going into a discussion concerning their function in soluble plant food concentrates, it may be noted that plant hormones are be-

ing included in some formulations. One preparation ("Hy-Gro") contains indolebutyric acid, another ("Sprout") incorporates *alpha*-naphthalene acetic acid.

In several instances, the nutrient preparations contain insecticides and fungicides in addition to the plant foods. In commenting on the use of foliage feeding preparations in which both organic insecticides and fungicides can be combined with the soluble nutrients, Arny(13) noted that this has the advantage of permitting the feeding to be done at the same time that the pest control work is carried out. Similarly, in considering the economic factors associated with the foliage application of nutrients, Pirone(14) pointed out that the costs are lowered when the nutrients are included with pest control sprays.

Though investigations are still in the early stages, there is the distinct possibility that certain antibiotics may yet be included with the soluble nutrient concentrates that are provided in dry form. The preliminary but indicative studies of several workers(29,30) point to the potential usefulness of these antibacterial agents, not only for combatting plant disease, but also for stimulating plant growth.

The formulation and manufacture of soluble plant food concentrates is a comparatively new and interesting phase of the fertilizer industry. Fertilizer makers and others concerned with the production of agricultural specialties might do well to keep abreast of the developments in this ever-growing field and in the steadily increasing market.★★

BIBLIOGRAPHY

1) Anon.: Chem. Week 71:44, July 19, 1952
2) Sayre, C.B.: Proc. Am. Soc. Hort. Sci. 36:732, 1938
3) Sayre, C.B.: "Starter Solutions for Tomato Plants for 1943", Bull. No. 706, New York State Agri. Exper. Sta., 1943
4) Committee on Fertilizers: "Fertilizer and Lime Recommendations for New Jersey" Circ. 541, New Jersey Agri. Exper. Sta., Aug., 1951
5) Sayre, C.B.: Farm Res. 7:No. 2, Apr. 1941
6) Seeley, J.G.: New York State Flower Growers' Bull. 33, May, 1948, p. 6
7) Anon.: Ohio Florists Assoc. Bulletin No. 272, May, 1952, p.2
8) ————: "Science and the Land," 72nd Annual Report, New Jersey Agric. Exper. Sta. 1950-51, pp. 48-9; also Agri. Chem. 7:67, July, 1952
9) Post, K.: Chem. Week 71:4, Aug. 23, 1952
10) Link, H.M.: Parks & Recreation, June, 1949, p. 376
11) Link, H.M.: Parks & Recreation, March, 1947
12) Everett, T.H.: "Gardening Handbook," Greenwich, Fawcett Publications, 1951, pp. 128-131
13) Arny, L.W.: Home Garden, Feb., 1951
14) Pirone, P.P.: Proc. 27th Nat. Shade Tree Conf., Aug. 27-31, 1951, p. 23
15) Tukey, H.B., Ticknor, R.L. Hinsvark, O.N. & Wittwer, S.H.: Science 116:-167, 1952
16) Miller, C.E. & Tuek: "Fundamentals of Soil Science," Ed. 2, New York, John Wiley & Sons, 1951, pp. 327-365
17) Tyson, J. (Michigan State College): Personal communication
18) Purvis, E.R. (Rutgers University): Personal communication
19) Butterfield, H.M. (University of California): Personal communication
20) Biekart, H.M.: "Care of House Plants," Circ. 542, New Jersey Agric. Exper. Sta., Oct., 1951, p. 11
21) Garner, H.C.: Agri. Chem. 7:101, Oct., 1952
22) Waggaman, W.A.: "Phosphoric Acid, Phosphates and Phosphatic Fertilizers," Ed. 2, New York, Reinhold Publ. Co., 1952, pp. 420-436
23) Whittaker, C.W.: "Mixing Fertilizers on the Farm," Farmers Bull. 2007, U. S. Dept. Agriculture, Aug., 1949, 13 pp.
24) Fernandez, L. (Monsanto Chemical Co.): Personal communication
25) Anon.: Manuf. Chem. 23:425, 1952
26) ————: "Science for the Farmer," 65th Ann. Report, Pennsylvania Agri. Exper. Sta., July, 1952, p. 20
27) Guyot, L.: Fr. Pat. 972, 321, 1951
28) Sayre, C.B.: Proc. Am. Soc. Hort. Sci. 38:489, 1940
29) Mitchell, J.W., Zaumeyer, W. J. & Anderson, W. P.: Science 115:114, 1952
30) Nickell, L. G.: Proc. Soc. Exper. Biol. & Med. 80:615, 1952

PLANE SPRAYER

(*Continued from Page 36*)

Spraying Equipment

IN 1949 and 1950, field experiments were conducted by the Bureau of Entomology and Plant Quarantine, and several agricultural colleges in controlling grasshoppers

by spraying with insecticides. By the fall of 1950, this research had indicated that grasshoppers could be controlled more effectively and more economically with one of the new sprays than with bait. This meant that dispersal apparatus previously used in Government and commercial aircraft for the control of grasshoppers would have to be modified to disperse liquid insecticides.

The bait-dispersal apparatus was designed so that with minimum modification it could, if necessary, be adapted for use in spraying. To provide for this alternate installation, the rear end of the hopper and the baffles were bolted rather than riveted into position. These parts are removed when the airplane is converted for spraying.

Six 170-gallon tanks, located in the forward 17 feet of the V sections of the bait hopper, are installed in tandem, three on each side. Each set of three is connected to separate 5-inch diameter manifolds, 14 feet long which carry the liquid to the spray pumps. The manifolds are located in the crawlway underneath the tanks. They extend just aft of each rear tank and downward to separate 5-inch emergency dump valves, located on the plane's belly and controlled hydraulically by the pilot. The tanks are filled through tubing that extends from the manifolds to quick-attaching hose fittings. Two centrifugal pumps, each driven by a separate hydraulic motor, supply the pressure for the spray system.

The insecticide is discharged through two 8-foot booms, one suspended behind each engine nacelle. Each boom is equipped with eight nozzles.

Spray is released or shut off by an electric gate valve attached to each boom inlet. Both gate valves can be controlled simultaneously or individually.

At 150 miles per hour at 200 feet, an effective swath of 500 feet is made. To apply the insecticide at the rate of 1 gallon per acre, under these conditions, the system discharges it at the rate of 150 gallons per minute. At this rate the maximum load of 100 gallons treats 100 acres in less than 7 minutes.

The conversion of this airplane from a baiter to a sprayer or from a sprayer to a baiter is accomplished by four men in approximately ½ day. During the four control seasons, 1949-1952, it applied bait and spray to approximately 976,775 acres of range and forest land for the control of Mormon crickets, grasshoppers, and gypsy moths. During the 1952 season, its year of greatest usefulness, it was used for treating these three insects over an area of 263,312 acres during a total flying time of approximately 200 hours.

More detailed information on this installation can be obtained from the Aircraft and Special Equipment Center, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, P. O. Box 7216, Oklahoma City, Oklahoma.

WEED CONFERENCE

(*Continued from Page 68*)

M. A. Sprague, New Jersey Agricultural Experiment Station, New Brunswick, N. J. He said that this type of application reduces the need for extensive cultivation in preparing the seed bed and replaces a considerable amount of tractor power and use of heavy equipment. He indicated that pastures should be sprayed around July 15 with 20 to 25 pounds of active acid sodium trichloracetate in 10 to 20 gallons of water mixed with .25% wetting agent and a half-pound of 2,4-D per acre. Renovation can be accomplished using the usual procedures except that cultivation can be limited to two times with a conventional tandem disk harrow, (second time at right angles to the first) in preparing the field for seeding.

Control of hawthorn shrubs was discussed by C. G. Waywell, Ontario (Canada) Agricultural College. He declared that hawthorn has completely covered thousands of acres of otherwise suitable agricultural land in western Ontario. A much larger area is partially infested and will be rendered useless unless this shrub is

brought under control. He reported that the amine salt, sodium salt, and the isopropyl ester of 2,4-D at rates of 1000 to 4000 ppm applied when the leaves were fully expanded and the flowers were in bud or in bloom, controlled the hawthorn. He also found that where basal bark treatments were used, oil was superior to water as a carrier for these herbicides. As a result of the research conducted over a period of three years, 2,4-D butyl ester has been found to be equal to or superior to 2,4,5-T esters, or mixtures of 2,4-D and 2,4,5-T butyl esters in almost all basal bark treatments.

Studying the effect of placing dormant basal spray on the root collar of scrub oak, W. C. Bramble, D. P. Worley and W. R. Byrnes, Pennsylvania Agricultural Experiment Station found that this method was more effective in controlling basal sprouting. The authors reported that a dormant spray of 2,4,5-T at a concentration of 12 pounds acid equivalent per 100 gallons of kerosene, when applied to scrub oak, gave complete top-kill when the spray was applied in low volume to either the base of the stem or the root collar. Basal sprouting, however, was prevented only when the spray was applied to the root collar. Spray applications to the ground around the plant had no apparent effects.

J. R. Orsenigo and Ora Smith, of Cornell University, reported studies on the chemical control of northern nut grass. They said that obtaining control of nutgrass in small, heavily infested areas is possible through the use of TCA at 75 pounds per acre, or the use of 2,4-D at 15 pounds per acre applied in a 5 percent emulsion of aromatic oil (at 100 gallons per acre). Where scattered nutgrass is to be controlled in fields that are under cultivation, the poblem is more difficult. The use of TCA and CMU appears to be worthwhile for this type of control where crops tolerant to these herbicides are being grown, it was indicated.

An informal mixer, with refreshments through courtesy of the Northeastern Weed Control Conference, was held in the early evening of Wednesday, January 7, at the New Yorker.

PEST LEGISLATION

(*Continued from Page 33*)

ists and food experts, the problem of handling pesticide residues is distinct from that of chemicals put into foods. The discussion of these subjects together has confused the issue and has given the public an erroneous idea of the problems. It has caused many people to fear that the wholesome fruits and vegetables, and the nutritious dairy products and meat with which our people are abundantly blessed, are dangerously contaminated. Some have advocated banning the use of pesticides.

The voluminous testimony presented before the Delaney Committee has been published and two reports have been rendered. The first of the reports (No. 3254) summarized briefly the results of the inquiry up to January 1951 and recommends the continuance of the hearing. The second report (No. 2356) issued June 30, 1952, is a majority report signed by five members of the 7-man committee with modified statements by two of the five members; and a minority report signed by the other two members. The majority report recommends the amendment of the Food, Drug, and Cosmetic Act so as to require the handling of pesticides in the same manner as that now applied to drugs.

If pesticides are considered separately from chemicals added to foods, as we believe they should be, there appears to be no impelling need for radical changes in the laws; which are now giving excellent protection to the public.

Although specific legislation is not recommended in the report of the Delaney Committee, it may be assumed that some of the members of that committee had in mind legislation similar to the Miller Bill, introduced by a member of the committee while the inquiry was in progress. Although this bill died in the Interstate and Foreign Commerce Com-

mittee, there are rumors that it will be reintroduced in the current session of Congress. The attitude of the Food and Drug Administration in relation to the Miller Bill was summed up by Paul B. Dunbar, then commissioner of that Administration, in his testimony before the Delaney Committee:

> "I feel that no new chemical or no chemical that is subject to any question as to safety should be employed until its possible injurious effect, both on an acute and/or long time chronic basis, has been shown to be non-existant. In other words, any chemical that is proposed for use ought to be proved in advance of distribution in a food product to be utterly and completely without the possibility of human injury."

Bernard L. Oser, director of Food Research Laboratories, ably commented on such requirements when he said:

> "The standards of safety implied in these statements are unrealistic because they are humanly and scientifically impossible to comply with. They illustrate a possible trend administrative discretion may take when faced with broad or ambiguous definitions. Such ultimate proof of safety demands knowledge of all possible deleterious effects and is predicted upon the demonstration of safety not merely in 'man' but in 'all men' irrespective of age, sex, dietary habits, physical environment, physiological stress, health, or disease. The day is not in sight when such proof will be possible. Furthermore, how could one logically justify requiring it only on behalf of new chemicals, but not for all chemicals or for foods themselves for that matter?"

The Miller Bill superimposes another registration procedure, but does not replace the present provisions for setting and enforcing tolerances under the Food, Drug, and Cosmetic Act or registering under the Insecticide Act.

If public health and other interests are being well protected by existing Federal legislation, why should additional laws be passed that will make insect control more difficult and burdensome?

Throwing additional impediments in the way of registering and marketing pesticides will, with little doubt, retard research and the development of new products, increase the cost to farmers of those materials that are marketed, and lead to conflicting responsibilities and increased costs to the Government.

In our opinion there is need for the adoption of State laws that will be effective in regulating the sale and use of pesticides within each State. Such laws are now in force in 44 States, and many of them are modeled after the Federal Insecticide Act. A few States have no legislation of this type and in some the laws probably need strengthening.

Legislation controlling custom applicators of pesticides is being considered by many States, and at least 20 have passed laws closely following a model prepared by several agencies. The general adoption of regulations of this type is needed.

Another need is apparent to all — that is, for an intensified effort to get all users of pesticides to follow recommendations to the letter. The importance of reading the label and following its instructions should be impressed on every individual using pesticides. Misuse of these materials is the problem, and laws cannot be depended upon to prevent such misuse or the accidents associated with it.

Effective pesticides are now available for almost every purpose. Means of applying them have been developed to meet most every situation. Full directions for use of insecticides and precautions against their misuse accompany every package.

Instances of misuse must be reduced to a minimum. Despite the cry of a few individuals that public health is seriously endangered, there is no evidence that pesticide residues are poisoning the people. The public needs to be informed of the great benefits from the use of pesticides and how they may be employed more safely and effectively.

I am convinced that education, not legislation, is the most urgent need today.★★

there's a place for

Pyrenone*

in your insecticide program

THERE'S NO CURE-ALL among the insecticides. Each chemical brings a different *combination of factors* into consideration. For every problem, there are several possible chemicals – but only ONE BEST solution.

Many times, that best solution is Pyrenone. For example, when toxic hazards are a consideration as in dairy operations, food processing plants and warehouses – anywhere that toxic hazards to people or animals, food or feedstuffs are involved – Pyrenone's low toxicity may become the deciding factor.

Where a *quick knock-down and kill* are desirable, Pyrenone may be your best choice. In combinations of chemicals, the fact that Pyrenone is *compatible* with almost all insecticides and fungicides makes it possible to step up effectiveness and/or economy by adding Pyrenone.

When *costs* are important, you'll find it worthwhile to measure the results using Pyrenone against other products – not only on a cost per pound or gallon, but also on *cost for effective control.*

Pyrenone is effective on a wide range of insects, yet has specific advantages for particular uses. So, it will pay you to look for Pyrenone on the label of the products you buy. For the products you sell, ask us about putting it on the label if it contains Pyrenone.

*Reg. U. S. Pat. Off.

U.S.I. INDUSTRIAL CHEMICALS CO.

Division of National Distillers Products Corporation,
120 Broadway, New York 5, N. Y.

Branches in all Principal Cities

In Canada: Natural Products Corporation, Montreal, Toronto and Vancouver

TOP EXECUTIVE AVAILABLE

Experienced as President, Vice President, General Manager, Sales Manager in manufacturing companies selling to mfg. trade, wholesalers, dept. stores, chains, in Hardware, Drug, Grocery field. Also contacts in the insecticide lines, over 12 years in the national and foreign markets.

Have outstanding national trade and sales organization contacts. Only interested in position with good firm that can offer high bracket salary & bonus for increased sales. Age 50. Can furnish bank, business, & personal references to your liking.

Write Box 713

AGRICULTURAL CHEMICALS

175 Fifth Ave. **New York 10, N. Y.**

Berkshire

SPECIALISTS in Magnesia for Agriculture

EMJEO (80/82% Magnesium Sulphate)
Calcined Brucite (fertilizer grade) 70% MgO
Calcined Magnesite 85 to 95% Mg O

POTNIT

(95% Nitrate of Potash)
for
Special Mixtures and Soluble Fertilizers
Other Fertilizer Materials

INSECTICIDES — FUNGICIDES

Mercury Compounds
for Agricultural Use

DITHIOCARBAMATES

Ferric — Zinc

EXPORT - IMPORT

Berkshire Chemicals, Inc.

420 Lexington Avenue, New York 17, N. Y.
Cable Address—"Berkskem" New York
Sales Agents for F. W. Berk & Company, Inc.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 175 Fifth Ave., New York 10. Closing date: 25th of preceding month.

Positions Wanted:

SALESMAN, 32, experienced in technical sales, seeks position as representative of agricultural chemical company. Excellent record in analogous fields. Single, will go anywhere. Now located in east. References. Address Box 715, c/o Agricultural Chemicals.

MS AGRONOMY, single, field experience in weed control, soils and turf. Formulated insecticides. Traveled widely. Chemical background. Seeks position in development or technical sales. Address Box No. 716 c/o Agricultural Chemicals.

ENTOMOLOGIST, B. S. A., M.S., M. P. H. Civilian experience includes one year with the Bureau of Entomology and Plant Quarantine, three years as staff entomologist at an Air Force major command headquarters. Address Box No. 717, c/o Agricultural Chemicals.

Miscellaneous:

DDT
SPOT—FUTURES
Other Agricultural Insecticides, Chemicals etc.
CHEMICAL SERVICE CORP.
86-02 Beaver St., N.Y. 5
HAnover 2-6970

Positions Open:

MULTI-WALL BAG SALESMAN
POTENTIAL DIVISION MANAGER

Established, growing paper bag manufacturer *offers tremendous opportunity* to man, strong on contacts, now selling in multi-wall field. Right man slated to head rapidly expanding multi-wall division. All replies will be handled in strict confidence. Box 714

Wanted By London Firm

Chemist with background able to produce cultures. Must have full practical knowledge of the Mushroom Spawn trade throughout. Would consider applicant or existing firm with plant to invest in the manufacture of Spawn on a large industrial scale, here in England. The prospects are good, with solid support of colossal business. Your reply will be held in absolute confidence, and references will not be contacted. Write R. C. Darlington, Hastingwood, Harlow, Essex, England.

"Pesticopoeia" Out Soon

Work on the new "Pesticopoeia" has reached the point where mimeographed copies were expected to be available sometime in February, according to Dr. J. L. St. John, Pullman, Washington, in charge of the project.

Dr. E. R. de Ong
Consultant
Entomology — Pesticides
Legal Service
Author of
Insect, Fungus & Weed Control
Chemistry & Uses of Insecticides
926 Stannage Ave., Albany 6, Calif.

FLORIDA FIELD TRIALS
Evaluations
of
Agricultural Chemicals.
DR. G. R. TOWNSEND
Box 356
Belle Glade, Florida

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist
(Formerly Director of Science, Government of the Philippine Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)
ADVISER ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS
Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.
1118 Emerson Street
Palo Alto, California

(More Classifieds Page 143)

PYROPHYLLITE

the ideal Diluent and Extender for INSECTICIDES

For fermate dusts, the recommended diluent is insecticide grade pyrophyllite

Ask For Our Pamphlet

GLENDON PYROPHYLLITE COMPANY

P. O. Box 2414, Greensboro, N. C. — Plant and Mines at Glendon, N. C.

Formerly Glendon Div., Carolina Pyrophyllite Co.

BOOK REVIEWS

(Continued from Page 115)

Insect Resistance in Crop Plants by R. H. Painter. Published by the MacMillan Co., New York. 520 pages, 6 x 9 inches, cloth binding, price $7.25.

The successful use of insecticides for control of agricultural pests has somewhat obscured the work done in the development of insect-resistant varieties of crops. This text reviews the differences in the responses of plant varieties to insects.

Introductory chapters of the book discuss the mechanisms of resistance, and the factors that affect the expression or permanence of resistance. Other chapters review studies on resistance in some of our more important crops such as wheat, corn, cotton, sorghums and potato. A valuable chapter discusses the methods and problems in breeding for resistance to insects in crop plants.

More than 65 figures and illustrations, and 25 tables supplement the text matter, while a supplementary bibliography provides additional literature references.

* * *

Phosphoric Acid, Phosphates and Phosphatic Fertilizers by W. H. Waggaman. Published by Reinhold Publishing Corp., New York. 683 pages, 6 x 9 inches, cloth binding, price $15.00.

This second edition of the American Chemical Society Monograph # 34 contains discussion on the mining and recovery of phosphate rock; processes employed in phosphorus compounds; function of plant and animal life; the economic aspects of manufacturing methods; and a complete list of U. S. patents on manufacture and use of phosphorus compounds. A particularly interesting chapter deals with the preparation of fertilizers.

* * *

DDT and Newer Persistent Insecticides by T. F. West and G. A. Campbell. Published by Chemical Publishing Co., New York. 632 pages, 6 x 9 inches, cloth binding, price $8.50.

The major part of this book is devoted to a discussion of the physical and chemical properties, manufacture, formulation, and applications of DDT. The second part deals with other chlorinated hydrocarbons, whose insecticidal properties have been discovered recently. These new insecticides are compared with DDT.

A number of illustrations and a reference list at the end of each chapter are important features.

CLIP AND MAIL TO

AGRICULTURAL CHEMICALS, 175 5th Ave., N. Y. 10, N. Y.

Please enter subscription(s) as follows:
(Check or money order enclosed)

☐ One year, $3.00 (Canada $4.00; Foreign $7.00)
☐ Two year, $5.00 (Canada $7.00; Foreign $12.00)

NAME .....
(Please Print)

FIRM .....

STREET .....

CITY .....

Advertisers' Index

(The Advertisers' Index has been checked carefully but no responsibility can be assumed for any omission)

MEETING CALENDAR

Cotton States Branch, AAEE, meeting with Louisiana Entomological Ass'n., Jung Hotel, New Orleans, La., February 9-11.

California Mosquito Control Conference, Odd Fellows' Hall, Sacramento, Calif., February 10-13.

Midwestern Chapter, National Shade Tree Conference, Cosmopolitan Hotel, Denver, Colo., February 11-13.

Southern Weed Control Conference, Jung Hotel, New Orleans, La., February 12 and 13.

Midwest Soil Improvement Committee meeting with Industry and Colleges, Palmer House, Chicago, February 20.

Alabama Pesticide Short Course, Auburn, Alabama, Feb. 24-25.

Southwestern Branch, A.A.E.E., Galvez Hotel, Galveston, Texas, February 26-27.

Fertilizer Section, National Safety Council, Atlanta Biltmore Hotel, Atlanta, March 1-3.

National Agricultural Chemicals Assn., Jung Hotel, New Orleans, La., March 11-13.

American Chemical Society, Pesticide Division, Hotels Statler and Biltmore, Los Angeles, Calif., March 15-19.

South Dakota Weed Control Conf., Pierre, S. Dakota, March 17-19.

North Central States Branch, A.A.E.E., Statler Hotel, St. Louis, Mo., March 19 and 20.

American Plant Food Council, The Homestead, Hot Springs, Va., June 11-14

National Fertilizer Association, Greenbrier Hotel, White Sulphur Springs, W. Va., June 15-17, 1953.

Pacific Branch, A.A.E.E., Lake Tahoe, Calif., June 23, 24 & 25, 1953.

Tale Ends

LIFE Magazine's first issue of 1953 featured two significant articles of interest to the agricultural chemical trade.

The first, "The Reign of Chemistry," pictured plants and processes of Monsanto Chemical Co., while the second heralded the agricultural revolution, under the title, "More Food for Less Work."

Monsanto was chosen as being representative of the entire chemical industry which has become a $9 billion factor in the economy. The company's activity in supplying insecticides, herbcides and fungicides as well as soil conditioners is brought out prominently.

The use of chemicals in achieving record yields of agricultural products was given a rather prominent place in the second article. Fertilizers and insecticides were given a high rating in a list of factors contributing to the over-all "revolution" and are among the most important materials on which future progress depends. "Fertilizers and cover crops help make richer soil, improved plants give bigger yields, insecticides and serums let more plants and animals live to maturity . . ." it notes.

•

Dr. Paul R. Miller, U.S.D.A., Beltsville, Md., regular contributor to "The Listening Post" in *Agricultural Chemicals*, is author of two important articles in the "Plant Protection Bulletin" published by the Food and Agriculture Organization of the United Nations in Rome, Italy. Dr. Miller's work appeared in the November and December issues of the publication under the title, "The Plant Disease Situation in the United States." The bulletin is distributed throughout the world through the United Nations.

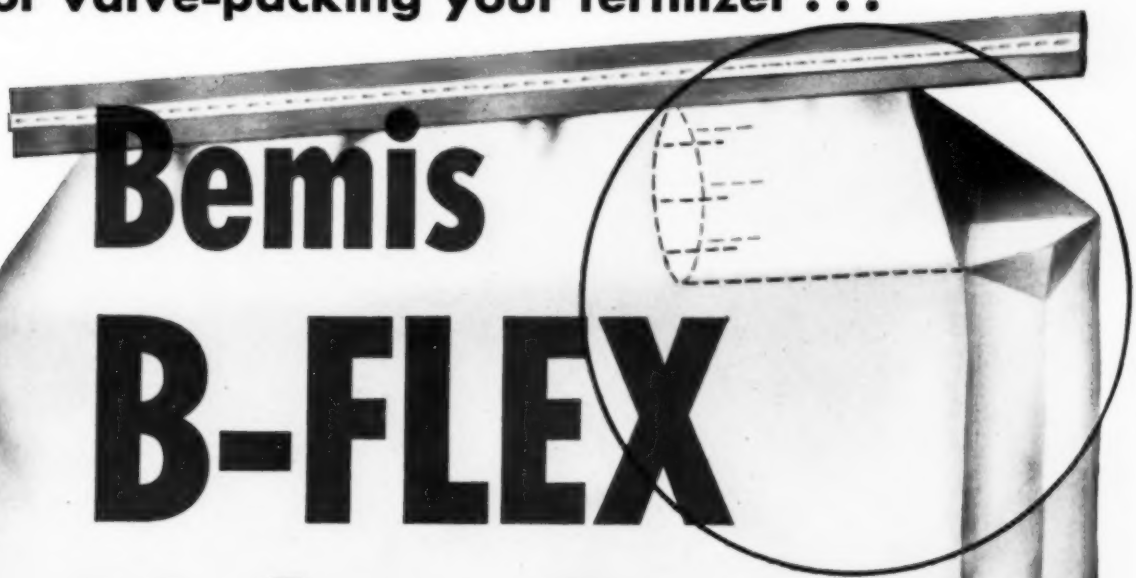
Dr. Miller, by the way, holds a record with *Agricultural Chemicals*, as having had an article in every issue since the publication was launched in May, 1946. He has built up quite a following of readers who always look for his column for late information on plant disease control.

•

One of the pitfalls into which unthinking reporters can fall is well illustrated in the little gem picked up in a newspaper recently:

". . . . Dr. Jones visited the schoolroom yesterday and lectured on 'Destructive Pests'. A large number were present."

The newest, best multiwall bags for valve-packing your fertilizer . . .



Bemis B-FLEX Valve Bags!

You should switch to Bemis B-FLEX promptly because . . .

1. LOWER BAG COSTS. You'll save up to $4 per thousand compared with conventional inner-sleeve valve bags.

2. LOWER PRODUCTION COSTS. Faster handling on your packing machines.

3. FASTER PACKING. Are jam-ups a problem? Not with Bemis B-FLEX. No flapping inner-sleeve to slow down material flow.

4. UNIFORM WEIGHTS. You can hit your weights "right on the button." Stop over-packing.

5. CLEAN PACKAGE. Minimum sifting.

6. BETTER CUSTOMER SATISFACTION. No loose, torn sleeves to get into the farmer's drill.

And, of course, you get the added benefit of Bemis' crisp, bright, multi-color printing — the finest printing your brand can have on multiwall bags.

Ask your Bemis Man for the complete B-FLEX story.

Bemis

General Offices
St. Louis 2, Mo.
Sales Offices in
Principal Cities

TOXAPHENE *kills* INSECT PESTS

Toxaphene dusts or sprays are approved for the control of an increasing number of harmful insects. All those listed above are included in latest recommendations. For specific information on toxaphene (chlorinated camphene 67-69% Cl), write to the manufacturer . . .

Naval Stores Department *HERCULES POWDER COMPANY* *970 Market St., Wilmington 99, Del.*

NX52-29